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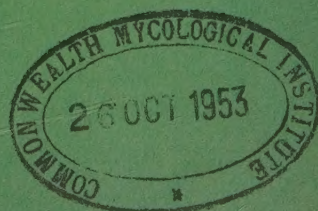
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THAILAND: II. ANIMAL INDUSTRIES¹

F. M. FRONDA²

WITH SIX TEXT FIGURES

Although the principal food of the people of Thailand is rice and fish, a considerable amount of meat is also consumed in the country. Pork is the favorite meat of the people and duck meat comes next. Water buffaloes and cattle are raised as a source of power and of meat.

Before World War II, Thailand was self-sufficient in both work and meat animals. The country even had a surplus of water buffaloes which was exported to Hongkong, Singapore, and Penang. As a result of the war and because of the ravages of diseases, especially rinderpest, there is now a shortage of work animals in the country. The price of meat has gone up considerably and is still going up, causing the authorities much worry.

Realizing the importance of the livestock industry to the economic life of the people, the government of Thailand recently created a committee to look after the promotion of this industry. For its promotional work, this committee has a large amount of government funds at its disposal and it can ask for more if necessary. It is composed of individuals who are genuinely interested in the industry and who have the welfare of the people at heart. Tangible results of the work of this committee are becoming noticeable and before many years are over, Thailand, as in prewar years, may again become, not only self-sufficient in work animals and in livestock products, but also an exporter of these commodities to neighboring countries. In fact, the ambition of the authorities concerned is to make Thailand the center of livestock production in Southeast Asia.

Cattle production. The farmers of Thailand largely depend upon the water buffalo and the ox to plow their fields. The water buffalo is used chiefly in Central Thailand where the farms are low and the soil, consisting of silt and heavy clay, is deep. In the higher places in the North where the soil is sandy, the ox is largely employed. In the North and Northeast, carts pulled by oxen (fig. 1) are the principal means of transportation.

The center of production of water buffaloes and cattle in Thailand is in the Northeast. This whole area is high table land, and although rather dry, it can support a luxuriant growth of pasture grasses. As the Northeast is not as thickly populated as the other regions of the country, it is the only place in Thailand where cattle

¹ General Contribution No. 856.

² Poultry Production Expert (Thailand, 1951-1952) of the Food and Agriculture Organization of the United Nations.

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can be raised in ranches. From the Northeast the animals are transported to the other regions where they are needed.



Fig. 1.—Oxen pulling carts in northern Thailand.

The cattle of Thailand are rather small and undersized. They are of various colors, but most of them are yellowish red. Their bodies are long and narrow and their legs are long. The horns are generally long and well curved forward. On the other hand, the water buffalo is low set but appears rugged and strong because of its coarse head and heavy horns. While albino water buffaloes are rather rare in this country, in Thailand they are frequently seen. It is apparent that the quality of both cattle and water buffaloes could be improved if a little attention were paid to the selection of the animals used for breeding. As it is now, the better animals, because they can command good prices on the market, are sold first and the small ones are left to propagate.

There is no sufficient supply of fresh milk in Thailand. In Bangkok, dairying is in the hands of small operators, all of them Indians. They use water buffaloes mostly. The animals are fed soilage inside the barn and are allowed to go out into the paddocks only late in the afternoon. A concentrate mixture consisting of rice, rice bran, soybean-oil cake, and a little sugar is cooked and fed to the animals. As in the Philippines, the calves are allowed to suck from their mothers before milking time.

Swine production. Pork being the favorite meat of the people, the raising of swine is an important industry in Thailand (fig. 2).

There are five types of pigs recognized in the country: (a) the Korat pig common in the Northeast, (b) the Lampang pig in the North, (c) the Chinese pig in the central region and along the coast, (d) the Meo pig in the North, and (e) the Singora pig in the South. The Chinese pig commonly raised in the Bangkok area has a big, flabby jowl, a sagging back, and a big abdomen. The Meo pig looks like a wild pig and is distinctly a bacon type. The Singora pig has characteristically small head and ears which look out of proportion to the rest of its body.



Fig. 2.—Portion of a herd owned by Thai war veterans.

Most of the pigs that are raised in Thailand ultimately reach the Bangkok markets, Bangkok being the center of consumption in the country. The pigs are shipped to Bangkok by rail, by canoe on the canals, or by freight truck. The pork market is controlled entirely by Chinese who buy the pigs from the farmers, butcher the pigs, and retail the pork in the market.

Several years ago, the war veterans of Thailand grouped themselves into a corporation to engage in livestock production. For this purpose they were granted a big loan by the government. They are now engaged in the raising of pigs and ducks. To help them further, the government passed a law to stabilize the prices of pork and duck eggs. In Thailand, even the slaughter of a pig for household consumption requires a permit.

Chicken production. Although chickens have been raised in Thailand from time immemorial, they have not been considered a good source of profit until recently, that is, until the last few years.

As in many farms and barrios in the Philippines, the chickens in Thailand live as scavengers. At present, however, the raising of chickens for profit has become so popular in Thailand that this subject is now literally the talk of the people all over the country. Not only the farmers are enthusiastic about poultry raising; even the top officials of the government are keenly interested in it and in its promotion.

The chickens of Thailand are of three distinct types. The so-called Cantonese chickens are popular for the production of both eggs and meat. The Aseel fowls are raised for meat and for fighting purposes. The third type, locally known as "Kai Jay," is common in the farms near the forests. These fowls are not very far removed from the wild Red Jungle fowls and the males are used as decoy to catch the males of the wild fowls. As may be expected, all of the three types are hardy, but they are small, are slow growers, and are poor producers of small eggs. Some Cantonese layers, however, are reputed to lay about 200 eggs each a year. The bulk of the chicken eggs that reach the Bangkok markets from the farms is produced by these fowls.

Of the introduced breeds, S. C. White Leghorns and Rhode Island Reds are the most popular. Australorps are fast increasing in popularity and Barred Plymouth Rocks trail very close behind. These fowls are of good quality; many of those now being raised on the poultry farms in the Bangkok area lay over 200 eggs each a year. The 365-day egg records of the 964 pullets of various breeds raised in the College of Agriculture, Kasetsart University, show the following distribution of egg production from 1950 to 1951:

RANGE IN ANNUAL EGG PRODUCTION	NUMBER OF LAYERS
1- 50	13
51-100	63
101-150	185
151-200	280
201-250	316
251-300	105
301-350	2

In this flock the highest record of 321 eggs in 365 days was produced by a Rhode Island Red. The second highest record was 307 eggs and this was made by an S. C. White Leghorn. All of the birds in this flock were hatched and raised in that College.

Of interest to Filipino poultry raisers and farmers are the results of crossbreeding studies conducted in the College of Agriculture, Kasetsart University. The following figures are self-explanatory and offer excellent food for thought for all who are interested in the elevation of the quality of the farm flocks in this country:

BREED	NUMBER OF INDIVIDUALS	AVERAGE EGG PRODUCTION IN 365 DAYS
S. C. White Leghorn	636	191
Rhode Island Red	66	161
Australorp	196	160
Barred Plymouth Rock	1	191
SCWL × Australorp	32	230
RIR × Barred Plymouth Rock	33	202

In this particular flock not only were the crossbred pullets better egg producers than their standard-bred sisters, but they also had a much lower mortality during the year than any of the introduced breeds. Encouraged by these results, the institution has engaged in more extensive crossbreeding in order to enable it to distribute cross-bred pullets at nominal cost to the farmers all over the country.

The greater part of the poultry and eggs sold in the markets is produced on general farms where the chickens are allowed to roam around and hunt for their feed. In other words, no special attention is paid to their housing, feeding, and care. It is a common practice among the farmers in the South to take their chickens with them to the farm during the planting and harvesting seasons. On commercial farms, however, the fowls are raised by modern methods of poultry farming. In the Bangkok area, many of the farmers raise their layers in individual battery laying cages, most of which are of local manufacture. This method is being encouraged for better sanitation as well as for greater safety in case of floods. Incidentally, to help beginners, the College of Agriculture, Kasetsart University, manufactures individual battery laying cages (fig. 3) in units of ten layers each and sells them at cost, or at approximately P25.00 a unit. These battery laying cages cannot be made fast enough to meet the demand.

The poultry raisers of Thailand will not have to worry about feeds for their poultry for some time to come because the country is self-sufficient in these feeds. Rice, corn, and sorghum are the chief grain feeds. There is an adequate supply of rice bran, and the supply is being conserved by the government by prohibiting its exportation to other countries. The other ingredients of the mash are broken rice (*binlid*), mungo, peanut-oil meal, and soybean-oil meal. Fish meal is locally manufactured. The following laying ration that is being used in the College of Agriculture, Kasetsart University, costs only about fifteen centavos a kilogram:

INGREDIENTS	AMOUNT IN KILOGRAMS
Rice bran	60
Broken rice (<i>binlid</i>)	8
Ground corn	8
Peanut-oil meal	8
Mungo meal	4
Fish meal	10
Ground oyster shell	2
Common table salt	1
Cod-liver oil	1

As in the Philippines, the natural method of incubation and brooding is used on the farms in Thailand. Some farmers now use small farm-sized incubators which are either imported from the United States and Australia or are locally made. During the last two years, a number of hatcheries using modern mammoth incubators have been established in the Bangkok area. Although the normal hatching season in Thailand is during December, January, and February, these hatcheries have to function the year round in order to supply the local demand for day-old chicks. In addition to these hatcheries, many duck-egg hatcheries also produce day-old chicks besides ducklings.



Fig. 3.—Type of laying batteries manufactured by the College of Agriculture, Kasetsart University, and sold to beginners at cost.

The chickens in Thailand are subject to many poultry diseases, the worst of which is the Newcastle disease. Several commercial poultry farmers have suffered serious losses from this disease during the last few years. Roup is particularly bad among the young growing stock. Because of this disease, both brooding and rearing mortalities are high. Fowl cholera, chicken pox, and pullorum are also rampant. The government has started a campaign to eradicate pullorum disease, and if this work is continued with vigor, a time may come when all commercial flocks in Thailand will be free from it. Internal parasites (worms) and external parasites (mites and lice) also make a heavy drain on the health of the fowls of Thailand, particularly of the imported breeds.

One significant difference between poultry marketing in Thailand and in the Philippines is that the bulk of the poultry sold in the former is sold dressed. Perhaps about 95 per cent of all chickens and ducks sold in the markets of Bangkok are dressed. For this reason, one of the big markets of Bangkok has a large poultry slaughterhouse where thousands of fowls are killed every day and the dressed poultry distributed to the other markets in the city. The

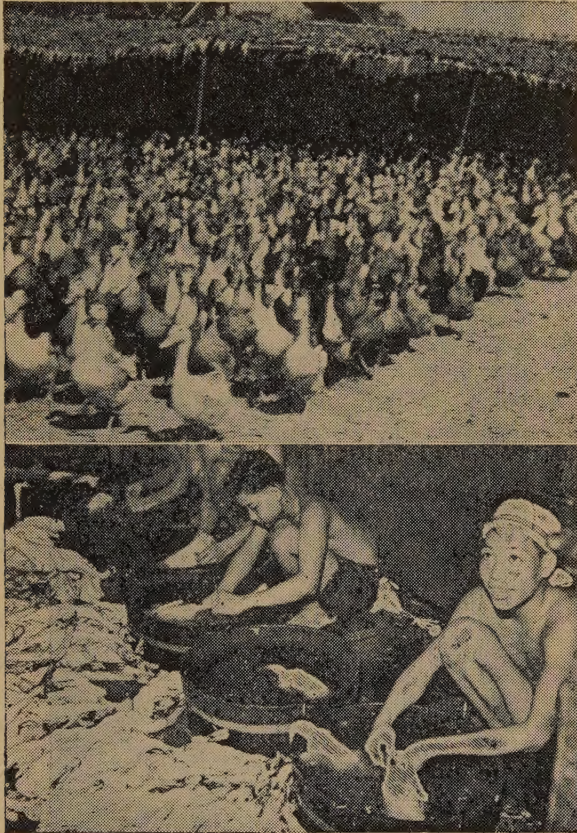


Fig. 4.—Upper panel, a flock of ducks owned by war veterans of Thailand. Lower panel, interior view of the poultry slaughterhouse in one of the big markets of Bangkok.

live fowls are shipped to Bangkok from general farms in distant areas by train, by banca, or by freight truck. On the whole, the poultry shipped to Bangkok are healthy and fairly well-fleshed. After being dressed, they are cleverly displayed to make them appear fat and plump. In many cases, the fowls are cut to pieces so that the purchaser may buy only the parts that he desires.

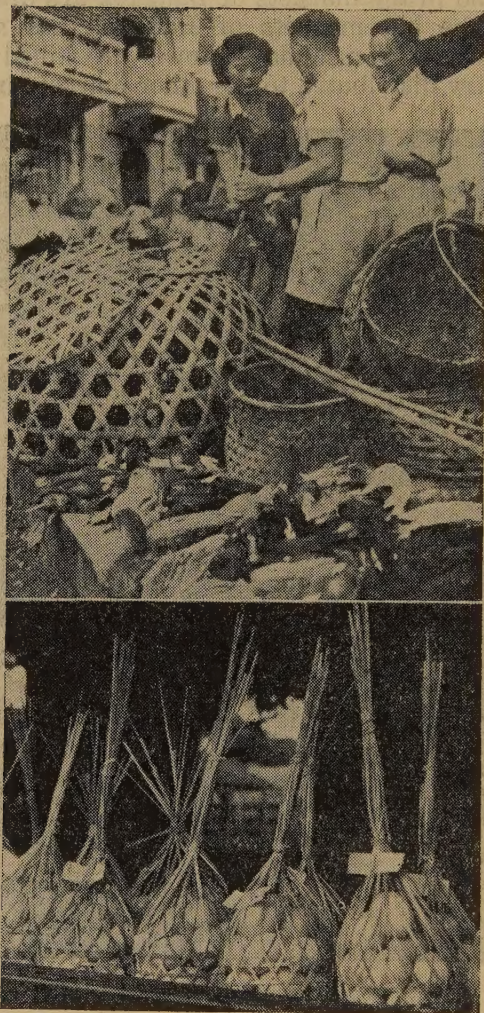


Fig. 5.—Upper panel, a scene in the live-poultry market of Bangkok. Lower panel, bamboo baskets commonly used to hold eggs for sale. Each of these baskets contains 25 eggs.

Duck production. The duck industry has been a popular and well-established industry in Thailand for a long time (fig. 4, upper panel). Indeed, the Thais are so fond of duck meat that at present perhaps more ducks than chickens are slaughtered (fig. 4, lower panel) and sold in the markets of Bangkok daily. Some authorities in the Ministry of Agriculture claim that in many places in Thailand more ducks than chickens are raised on the farms. There may be some truth to this claim, as may readily be seen when one travels through the various regions of the country.

The ducks in Thailand are not unlike those raised in the Philippines. They are so similar in color and in size that if the Thailand ducks were allowed to mingle with those raised in this country, it would be very difficult, if not altogether impossible, to tell them apart. The duck raisers in Thailand, however, distinguish two distinct types: one with yellow legs and beak and the other with black legs and beak. Except for these differences, the two types are similar.

The center of the duck industry in Thailand is the region around the city of Bangkok (fig. 5, upper panel) and towards the south along the Gulf of Siam. Here, flocks that number 1000 or more individuals are common. Many thousands of eggs are shipped every day to Bangkok, the center of egg consumption. As a matter of fact, the bulk of the egg supply in this city consists of duck eggs (fig. 5, lower panel). It has been so for many years now and may be so for many more years to come. To help the consumers, the government lowered the ceiling price of duck eggs to such a level as to be within the easy reach of the great mass of the people. At present the price of duck egg is approximately 50 per cent lower than that of chicken egg. Under this condition, it is difficult to understand how the duck growers make a profit, but they continue raising ducks for egg production just the same.

The duck-egg hatchery business in Thailand is a big business. To supply the needs of the commercial duck raisers and of those who raise small flocks on general farms, there are duck-egg hatcheries (fig. 6, upper panel) in many places in the country. Undoubtedly, the largest number is in Bangkok where there are about twenty, each with a capacity of about 20,000 eggs. These hatcheries are operated by Chinese who also control the marketing of eggs, ducklings (fig. 6, lower panel), and mature ducks for meat. These hatcheries are operated in much the same way as the mammoth hatcheries in Pateros.

The ducks are housed just like those in the Philippines. They are kept in bamboo houses with nipa roofs. For shade in the yards, sheds made of similar materials are constructed. Once a year the thick layers of duck manure that have accumulated on the floors of the houses are dug and sold at a very good price to commercial vegetable gardens in the Bangkok area, thus providing an excellent source of additional income for the duck raisers. The disposal of the thick

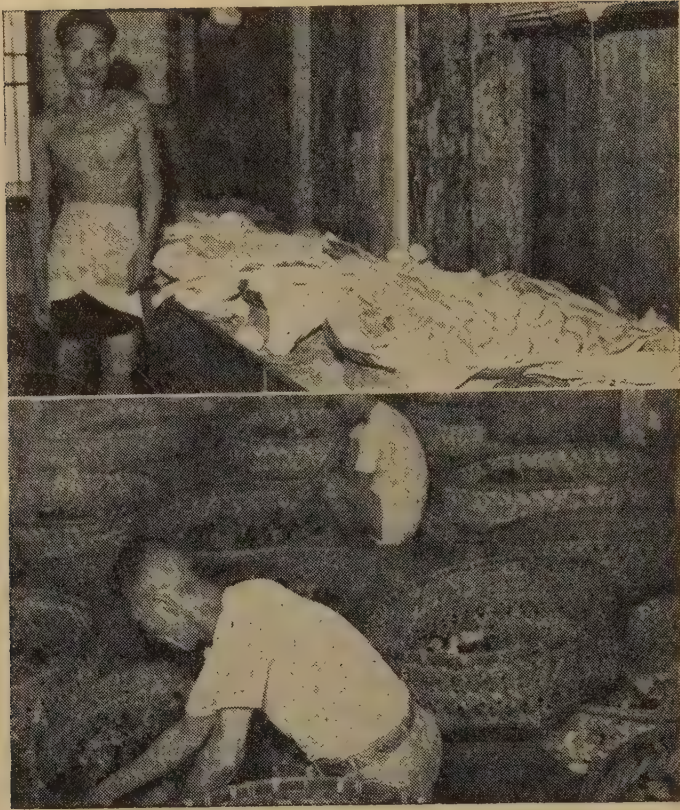


Fig. 6.—Interior views of one of the many duck-egg hatcheries in Bangkok. These hatcheries are similar to those in Pateros, Rizal, in construction and operation. Upper panel, the incubators; lower panel, sorting of the newly hatched ducklings.

accumulation of empty snail shells near the duck houses, however, is a problem to the duck growers.

The feed of the ducks consists mostly of coarse rice bran, snails, and small fish. Sometimes *binlid* is also given. The mixture of rice bran, *binlid*, and fish is boiled slowly to soften the fish bones. When the ducks are raised inland, they are allowed to forage along the roads and in the rice fields. In this way, the birds can feed on aquatic plants and animals in addition to rice bran and *binlid*. The ducks are driven to the fields morning and afternoon.

The laying flocks are culled regularly. An "expert culler" goes around the different flocks, handling the birds and removing those that either have ceased to lay or are no longer laying profitably. The operator culls the flock at no cost to the owner provided, how-

ever, that all culls are sold to him. He sends these culls to the Bangkok markets which can absorb a considerable number of ducks for butchering. Thus, the old ducks find a ready market in Bangkok. Many of the flocks are culled when the birds are about three years old.

The marketing of duck eggs is under the strict control of the government. The duck raisers are required to sell 80 to 85 per cent of their daily production to the representatives of the Department of Public Welfare. The rest of the produce may be sold in the public market at a price not to exceed the ceiling set by the government. The law also prohibits the movement of duck eggs, that is, nobody is allowed to bring out more than two dozen eggs from the town where these eggs are produced. To get a better price, the duck raisers sometimes smuggle the eggs to other regions and perhaps to neighboring countries as well.

It is surprising that *balut* is not known in Thailand. Thais who have been to the Philippines and know what *balut* is say that a similar product sells fast in their markets. This so-called *balut*, however, is really an egg the germ of which has died after it has reached the third week of incubation. A duck product that is as popular in Thailand as it is in the Philippines is the salted duck egg. These eggs, however, are not painted red as they are in this country.

Of particular interest to Filipinos is the fact that in Thailand almost every part of either the chicken or the duck is utilized. In the slaughterhouses, the feathers are saved, dried, and sorted for local use as well as for export. The blood is collected and sold in the form of a cake about two centimeters thick and ten centimeters in diameter. The legs are saved and used in the preparation of soups and other special dishes. The intestines are cleaned and cooked either by boiling or frying. The giblets are sold separately. Roasted and fried ducks are so popular in Thailand that practically no party is without either dish on its menu. For this purpose, the older the ducks are the more they are appreciated.

MELANCONIUM FRUIT ROT OF TOMATO¹

F. T. ORILLO and B. B. BOMBAY

WITH THREE TEXT FIGURES

Melanconium fruit rot is a disease of tomato affecting not only the fruits but also the stems, leaves, and flowers. It attacks tomato fruits in the field, in transit, and in the market and causes small but frequent losses to tomato producers and retailers.

The lesions caused by the disease on the fruit are brown to dark brown, oval or circular, flattened or slightly depressed, firm, and marked with greenish-black concentric bands composed of masses of conidia of the fungus. Leaf and floral lesions first appear as blackish-brown specks with yellowish water-soaked borders; later they become dark brown and coalesce to form larger lesions. The stem is not attacked by the fungus under ordinary conditions.

The local disease is caused by *Melanconium lycopersici* Orillo which grows luxuriantly and produces abundant conidia on potato-dextrose agar, nutrient-dextrose agar, tomato-decoction agar, oatmeal agar, and onion agar. Cross-inoculation experiments showed that Irish potato, *Datura*, and eggplant fruits are readily infected by the pathogen.

The conidia of the fungus may remain viable for five to six months in diseased host tissues and may be disseminated by rain, wind, and insects and by the shipping of diseased fruits and seeds. The disease may be controlled by sanitation, crop rotation, selection and disinfection of seeds, careful handling of fruits during harvesting and packing, and perhaps by protecting the plants with fungicides such as "530 Spraycop" and "Fer-mate." Tomato varieties resistant to the disease may be developed.

Melanconium fruit rot is one of the diseases which affect tomato fruits in the greenhouse, in transit, and in the market in the United States. Ramsey and Link (1932) reported that the disease causes decay of tomato fruits and that the lesions produced by the pathogen provide openings for secondary decay-producing organisms. The fruits thus affected are a source of small but frequent losses to the tomato producers and retailers.

Since very little is known about the disease in the Philippines, this investigation was conducted from November, 1951, to September, 1952, in the vegetable gardens of the College of Agriculture and its vicinity and in the laboratory of the Department of Plant Pathology to determine what measures may be used to control the disease.

THE DISEASE

Geographical distribution and economic importance

Melanconium fruit rot has been reported from Cuba, Ohio, and Texas (Ramsey and Link, 1932). According to Dr. George F. We-

¹ Central Experiment Station Contribution No. 1669. Based on the thesis presented by the junior author for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Plant Pathology under the direction of the senior author. Read by the senior author before the Los Baños Biological Club.

ber,² the disease is found in Florida. Its occurrence in the Philippines was reported for the first time by Orillo (1951) who had observed in January, 1951, that at least five per cent of the tomato fruits in the vegetable garden of the U. P. Rural High School, College of Agriculture, Laguna, were affected by the disease. He also found fruits in all stages of infection in local grocery stores. Although those with slight infections were still salable, their market value was very much reduced.

Symptoms

On the leaves. An early symptom of the disease on the leaves is the appearance of minute blackish specks with yellowish water-soaked borders generally starting from the margin. Lesions may also originate on the central part of the leaf blade. Under favorable conditions, they enlarge and the central portions gradually change in color from blackish to dark brown. In the advanced stage of infection, the lesions coalesce and form extensive patches of dead tissues, which cause the entire leaf to shrivel and fall off prematurely. As the leaf rots on the ground, tiny masses of greenish-black fruit bodies of the fungus can be seen with the naked eye on the leaf surfaces.

On the stem. Ordinarily, the stem of the tomato plant is not affected by the disease. When the stem is mechanically injured and subsequently inoculated, however, infection takes place, resulting in the formation of numerous, small, light- to dark-brown spots. In severe cases of infection, the succulent terminal portion of the stem collapses.

On the flower. The flower is affected by the disease in all stages of its development. In flower buds, infection begins on the tips of the calyx and advances towards the peduncle; in opened flowers, infection starts either on the tips of the calyx or on the margins of the corolla and eventually extends to the peduncle also. Young lesions appear as light- to dark-brown specks on these floral parts. As the disease progresses, these minute lesions increase in size and later coalesce, covering the entire flower. Under a moderately moist condition, white growth of mycelium is usually found covering the badly diseased flowers. When the lesions reach the base of the peduncle, the flower readily falls off.

On the fruit. The tomato fruit, like the flower, is affected by the disease in all stages of its development. The lesions, as described by Orillo (1915), are brown to dark brown and oval or circular in shape. The tissues bordering the lesions are discolored and slightly sunken; they form a distinct narrow zone between the diseased and healthy tissues. The skin of the healthy portion of an infected fruit becomes yellowish sometimes, but in most cases it retains its normal color. In the advanced stage of the disease, the

² Personal correspondence of Dr. George F. Weber of the Department of Plant Pathology, University of Florida, with the senior author.

lesions enlarge to a diameter of one-half inch or more, becoming more or less flattened or slightly depressed. They are conspicuously marked with greenish-black concentric bands composed of masses of conidia of the fungus (fig. 1C and D). The lesions are rather firm

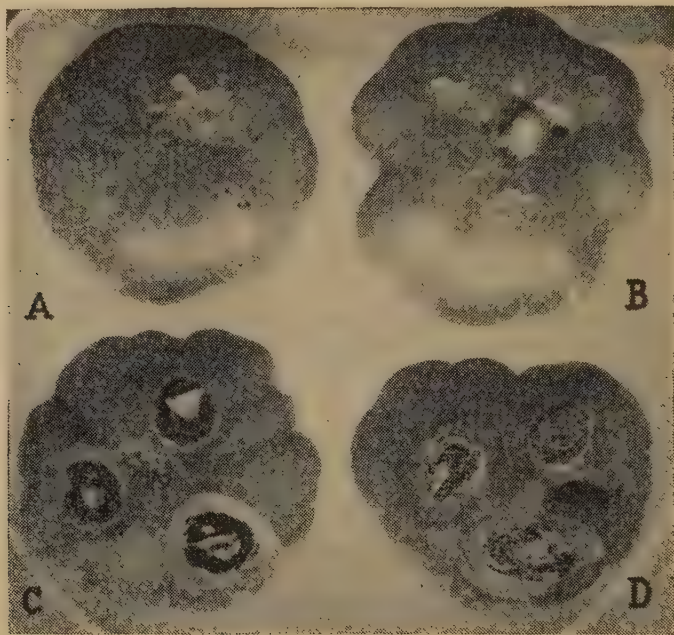


Fig. 1.—Healthy (A and B) and diseased (C and D) tomato fruits photographed 14 days after treatment. ($\times \frac{2}{3}$). (A) Pin-pricked fruit smeared with sterile potato-dextrose agar on the injured portions of the rind. The discolored specks are pin injuries. (B) Uninjured fruit smeared with sterile potato-dextrose agar. (C) Pin-pricked fruit inoculated with bits of agar medium containing mycelium of *Melanconium lycopersici*. Note the distinctly bordered lesions on which greenish-black masses of conidia are abundantly produced. (D) Uninjured fruit inoculated with bits of agar medium containing mycelium of *Melanconium lycopersici*. Note that the lesions are well developed although the masses of conidia are not as abundant as in C. (Photographed by Dr. J. Banzon, Photographic Division, College of Agriculture).

and are not as soft and watery as those produced by the tomato anthracnose fungus, *Colletotrichum phomoides* (Sacc.) Chester (Ocfemia, 1931). The diseased fruits may either persist on the plant and eventually become mummified or may fall off and deteriorate rapidly as a result of the combined action of the pathogen and other saprophytic organisms in the soil.

CAUSAL ORGANISM

From the spore masses on diseased tomato fruits, transfers were made with a sterilized inoculating needle to potato-dextrose agar in Petri dishes. Abundant white mycelial growth developed on the agar medium within two days. After one week, when the fungus had already sporulated, spores were transferred again to several potato-dextrose agar slants. Pure cultures of the fungus obtained from these transfers were used in cultural studies and inoculation experiments.

Morphology

Mycelium. The mycelium of the causal fungus grows readily in pure culture. The hyphae are septate, fine, and hyaline when young; they become dull white to neutral gray, profusely branched, with granular contents, as they grow older (fig. 2A). At maturity,

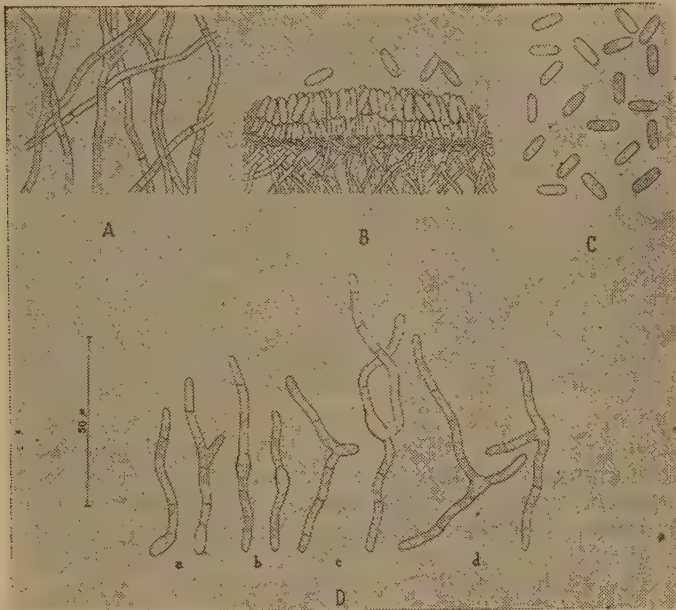


Fig. 2.—Camera lucida drawings of (A) mycelium of *Melanconium lycopersici* taken from a 12-day-old potato-dextrose agar culture; (B) section through an acervulus, showing the arrangement of conidiophores and conidia; (C) conidia; and (D) conidia germinating on potato-dextrose agar on glass slides after 6 hours. (Photographed by O. G. Laforteza).

the hyphal walls become thicker and the cell contents denser than those of the young ones. Measurements of 200 hyphal cells taken from a 20-day-old culture on potato-dextrose agar show that the cells range in size from 12.3×1.8 to 58.8×2.7 microns. The average size is 35.32×2.35 microns.

Acervuli. On the average the fungus produced acervuli on onion agar in two days, on potato-dextrose agar in four days, and on inoculated tomato fruits in seven days. Sometimes the acervuli are separate, but in most instances they are in clusters. They are superficial and are not buried in the medium or host tissues. On both the agar media and infected tomato fruits, acervuli are produced in concentric bands or rings (fig. 1C and D; fig. 3). They are greenish black and conspicuously raised on account of the spore masses which accumulate on top of the conidiophores. They are not setose. Measurements of acervuli taken from diseased tomato fruits show that they range from 150.0 to 257.5 microns in diameter. The average diameter is 205.25 microns.

Conidiophores. The conidiophores are short, erect, hyaline, non-septate, and unbranched. They are very numerous and crowded, forming a palisade-like structure within the acervulus (fig. 2B). A single conidium is borne at the apex of each conidiophore. The size of the conidiophores ranges from 2.0 to 5.5 $\times$ 1.1 to 2.8 microns. The average is 3.43 $\times$ 2.23 microns.

Conidia. The conidia are thin-walled, non-septate, and oblong (fig. 2C). Young conidia are hyaline, and as they grow older they become slightly greenish. They are easily detached from the conidiophores and form greenish-black, slimy masses on the surface of agar media and on the lesions of infected tomato fruits (fig. 1C and D; fig. 3). Measurements of 200 conidia were made from pure cultures on potato-dextrose agar slants. The length ranges from 3.6 to 12.2 microns, and the width from 1.5 to 3.3 microns. The average size is 7.33 $\times$ 2.52 microns.

Physiology

Growth and conidial production of the fungus on different agar media. The growth characteristics and conidial production of the fungus were studied on nine different culture media, namely, potato-dextrose agar, nutrient-dextrose agar, nutrient agar, corn-meal agar, malt agar, onion agar, oatmeal agar, tomato-decoction agar, and water agar. Triplicate cultures in Petri dishes were made for each medium. The plated media were planted at the center to a bit of potato-dextrose agar containing mycelial fragments of the fungus. The amount of inoculum transferred to each plate was made as uniform as possible. The planted plates were incubated at room temperature. The diameter of mycelial growth was measured and the sporulation of the fungus observed daily for six days. Changes in the color of the fungus colony as well as of the media were also noted. The colors were named according to Ridgway's color standards (Ridgway, 1912). The results are summarized in table 1.

The most abundant mycelial growth was obtained on potato-dextrose and nutrient-dextrose agars (table 1). Growth was fairly abundant on oatmeal, tomato-decoction, onion, and nutrient agars. The fungus grew poorly on corn-meal and malt agars. It did not

grow on water agar. The best production of conidia was observed on potato-dextrose agar. Sporulation was fairly abundant on the rest of the media, except on corn-meal and malt agars where the production of conidia was scarce.

The fungus grew very rapidly on oatmeal agar, the colony attaining an average diameter of 39 millimeters after six days. It grew quite slowly on corn-meal and malt agars. After six days, it produced colonies which measured 26 millimeters in diameter. Although the fungus grew fast on the oatmeal agar, the mycelium produced was comparatively thinner than that produced on potato-dextrose and nutrient-dextrose agars.

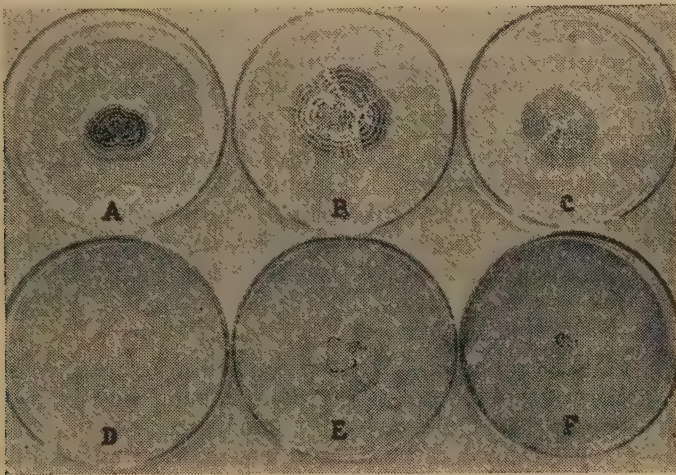


Fig. 3.—Growth and sporulation of *Melanconium lycopersici* on various agar media after 8 days. (A) potato-dextrose agar, (B) oatmeal agar, (C) nutrient-dextrose agar, (D) tomato-decoction agar, (E) onion agar, (F) nutrient agar. (Photographed by Dr. J. Banzon, Photographic Division, College of Agriculture).

Effects of varying hydrogen-ion concentrations on growth and conidial production of the fungus. To determine the effects of varying hydrogen-ion concentrations on growth and conidial production, the fungus was grown on potato-dextrose agar with pH ranging from 1.4 to 10.4. The agar medium was adjusted to the desired pH by the addition of either N/20 HCl or N/20 NaOH. The pH readings were determined with the aid of a LaMotte colorimeter. Triplicate cultures were made for each pH. All cultures were kept at ordinary room temperature. The diameter of mycelial growth was measured and the production of conidia observed daily. The results are presented in table 2.

The fungus grew better on alkaline than on acidic media (table 2). Mycelial growth was best on the medium with a pH of 7.4.

The gross differences in mycelial growth and sporulation at pH 6.4, 7.4, and 8.4 were very slight. Sporulation was most abundant at pH 5.4 although mycelial growth at this pH was slightly less than that at pH 6.4, 7.4, and 8.4. At pH 9.4 and 10.4, growth and conidial production were fairly abundant. A very slow and thin mycelial growth with no apparent sporulation was produced at pH 3.4. The fungus did not grow at pH 1.4 and 2.4. The experiment was repeated and practically the same results were obtained.

Since the fungus grew better on alkaline medium, the pH of the juice of healthy and infected ripe tomato fruits was determined with a Beckman pH-meter. The juice of the healthy fruits had a pH of 3.3, whereas that of 18-day-old inoculated fruits had a pH of 7.8. This shows that during the development of the disease, the acidic tomato juice gradually became alkaline, thereby creating a condition more favorable for growth of the fungus within the host tissues.

Germination of conidia. Tap water, distilled water, potato-dextrose solution and potato-dextrose agar were used as media for spore germination. Conidia were taken from potato-dextrose agar cultures and mounted in tap water, distilled water, and potato-dextrose solution in van Tieghem cells and on thin layers of potato-dextrose agar on sterilized glass slides. These were observed hourly for the germination of conidia.

Under laboratory room temperature the conidia germinated within 6 to 12 hours in potato-dextrose solution and on potato-dextrose agar; in tap and distilled water they germinated within 12 to 24 hours. Usually the conidium produced one or two hyaline germ tubes from either end (fig. 2Da). In some cases, however, it produced one or two germ tubes from both ends (fig. 2Db-c); occasionally a germ tube was produced from the side of the conidium (fig. 2Dd).

Viability of the fungus. The viability of the conidia produced on diseased ripe tomato fruits and on agar cultures was observed. Infected fruits with abundant conidia were placed inside a glass jar plugged with cotton and kept in the laboratory side by side with several potato-dextrose agar slant cultures. At intervals of one month, viability tests were carried out; the conidia were suspended in sterile distilled water in van Tieghem cells and their germination was observed. In the last tests, when no germination was observed in the van Tieghem cell preparations, conidia were transferred to newly prepared potato-dextrose agar slants to further check their viability. It was found that conidia, which apparently had lost their viability and failed to germinate in distilled water, did not germinate on potato-dextrose agar either. The tests showed that the conidia from diseased tomato fruits remained viable for six months, whereas those from the agar medium retained their viability for five months.

Taxonomy

The disease is caused by *Melanconium lycopersici* Orillo. In 1951, this melanconiaceous fungus was found on tomatoes in the College of Agriculture and was described as new by the senior author.

Pathogenicity

To test the pathogenicity of the fungus, tomato seeds and plants at different stages of development, as well as green and ripe tomato fruits, were inoculated. In all inoculation experiments, four varieties of tomato were used, namely, American variety, Big Susong Kalabaw, Small Susong Kalabaw, and Native wild variety.

Inoculation of tomato seeds: Experiment 1. On January 10, 1952, two hundred seeds of each of the tomato varieties were disinfected with 1:1000 mercuric bichloride solution and rinsed twice with sterile distilled water. One hundred seeds were mixed with mycelium and conidia of the fungus and planted in potted sterilized soil. As control, the remaining 100 seeds were also planted in potted sterilized soil. The pots were watered regularly and observations on the germination of the seeds were made daily.

The percentages of seed germination of the four varieties are as follows:

TREATMENT	AMERICAN VARIETY	BIG SUSONG KALABAW	SMALL SUSONG KALABAW	NATIVE WILD VARIETY
	per cent	per cent	per cent	per cent
Control	96	92	94	96
Inoculated	6	2	5	8

The results show that the fungus markedly reduced the percentage of germination. Microscopic examinations showed that the fungus penetrated through the seed coats and caused decay of the seed contents.

Experiment 2. Another experiment on the effect of the fungus upon seed germination was made on January 12, 1952. Again 200 seeds of each variety were disinfected. One hundred seeds were planted in pots of sterilized soil mixed with the inoculum, consisting of a 26-day-old culture of the fungus on corn-meal-sand medium prepared according to Riker and Riker's formula (1936). The proportion of the mixture was 1:5, that is, one part of inoculum to five parts of soil by volume. The other 100 seeds were planted in a 1:5 mixture of sterilized corn-meal-sand medium and sterilized soil to serve as control. The pots were watered regularly and observed daily for germination of seeds.

The percentages of seed germination of the four varieties are as follows:

TREATMENT	AMERICAN VARIETY	BIG SUSONG KALABAW	SMALL SUSONG KALABAW	NATIVE WILD VARIETY
	per cent	per cent	per cent	per cent
Control	74	49	69	73
Inoculated	0	0	0	0

All the seeds planted in the inoculated soil did not germinate. Their failure to germinate, however, can not be ascribed wholly to infection of the seeds by the fungus since the germination of seeds in the control pots was markedly lower than that of seeds planted in sterilized soil alone (see results of preceding experiment). The corn-meal-sand medium seemed to have had a deleterious effect on seed germination; its presence in the soil in combination with the fungus probably impaired totally the germination of the seeds. As in experiment 1, the inoculated seeds were found to have been invaded by the fungus.

Inoculation of tomato plants at different stages of development:
Experiment 1. On January 11, 1952, forty 26-day-old seedlings of each of the four varieties were inoculated by spraying with a spore suspension of *Melanconium lycopersici*, which had been grown for 16 days on potato-dextrose agar. Twenty seedlings were pricked lightly with sterilized pins to simulate the punctures of insects. The rest were not injured. Forty seedlings of each variety, 20 of which were also pin-pricked, were sprayed with sterile water and used as control. The inoculated and control seedlings were placed inside the damp chamber for 48 hours. Afterwards they were taken outside the laboratory and placed under the shade for further observation.

Small, discolored, water-soaked, circular to oblong lesions were produced on the leaves of the inoculated seedlings in 24 to 48 hours, infection being more pronounced on the injured seedlings than on the uninjured ones. Ten days after inoculation, the majority of the inoculated seedlings were dead. A few of the inoculated unpricked seedlings of the Big and Small Susong Kalabaw and the Native variety recovered gradually from infection.

Experiment 2. Twenty 60-day-old tomato plants of each variety were inoculated with a spore suspension of the fungus on February 3, 1952, and 20 others were used as control. The plants were given the same treatment used in experiment 1.

Twenty-four to 48 hours after inoculation, characteristic symptoms appeared on the leaves and on the pricked stems. In ten days both pricked and unpricked inoculated plants were almost completely defoliated and the shoots drooped and dried up, whereas the control plants remained healthy throughout the period of observation.

Experiment 3. On March 4, 1952, twelve 90-day-old bearing tomato plants of each of the four varieties were sprayed with spore suspension taken from a 16-day pure culture of the fungus. Half of the plants were pricked on the stems, leaves, and fruits before spraying; the rest were not injured. An equal number of control

plants consisting of injured and uninjured individuals was maintained.

Symptoms of the disease were produced on the leaves, flowers, fruits, and pricked stems of all inoculated plants in 24 to 48 hours. In plants under partial shade outside the laboratory, the lesions on the flowers and fruits continued to enlarge, but those on the stems did not increase in size any further. Most of the infected leaves fell off and the infected flowers and fruits dropped to the ground as the lesions reached the peduncle. The control plants kept under similar conditions remained healthy and the fruits developed to maturity.

Inoculation of tomato fruits: Experiment 1. Four mature green fruits of each variety were inoculated on March 12, 1952. The fruits were first disinfected with a 1:1000 mercuric bichloride solution for five minutes and rinsed twice with sterile distilled water. Two fruits were pricked lightly with sterilized pins. Both injured and uninjured fruits were inoculated with bits of potato-dextrose agar containing 5-day-old mycelium of the fungus. Four other injured and uninjured fruits were smeared with sterilized potato-dextrose agar to serve as control. The control and inoculated fruits were kept under bell jars.

Symptoms appeared on the inoculated fruits in two to three days. Dark-brown, oval to circular, sunken but firm lesions with abundant conidia were produced in 12 days. The control fruits remained normal.

Experiment 2. On March 12, 1952, four medium-ripe fruits of each variety were inoculated. Except for the method of inoculation, the treatments given to the fruits before and after inoculation were the same as those used in experiment 1. In this experiment, the fruits were sprayed with a suspension of conidia taken from a 20-day pure culture. Control fruits were sprayed with sterile water.

In two to three days, the characteristic symptoms were noted on the inoculated fruits. The lesions enlarged faster and more conidia were produced on the ripe fruits than on the green. The lesions coalesced and in 18 days the fruits were completely covered with conidia. The control fruits remained healthy throughout the experiment.

Reisolation of the fungus. In every inoculation experiment, the causal fungus was reisolated from infected tomato stems, leaves, flowers, and fruits. Its morphological and cultural characters were compared with those of the original fungus. In all cases, the reisolated fungus was found to be identical with *Melanconium lycopersici*.

Varietal susceptibility and resistance

In the previous inoculation experiments, the four tomato varieties seemed to differ slightly in their susceptibility to the disease. To confirm this, plants and fruits of the four varieties and of an

introduced tomato strain, Hawaii strain No. 44,³ were further tested. Twenty-day-old seedlings, 60-day-old plants, plants at the fruiting stage, and green and ripe fruits were inoculated with spore suspension of the fungus. All other treatments given to the inoculated plants were exactly the same as those employed in the inoculation experiments discussed earlier. The American variety, Big Susong Kalabaw, Small Susong Kalabaw, and Hawaii strain No. 44 exhibited practically the same degree of susceptibility to the disease. Inoculated plants at different stages of development became either partially or completely defoliated. The Native wild variety, however, seemed to be less susceptible. The inoculated plants became infected, but a good number of them were able to recover from the disease.

In the fruit inoculation experiments, Big and Small Susong Kalabaw appeared to be less susceptible than the others. It took a longer period to infect the green and ripe fruits of these two varieties and the size of the lesions increased less rapidly than the lesions on fruits of the other varieties. This difference may be attributed to the comparatively thicker rind of the two varieties.

Host range

Cross-inoculation experiments were conducted to determine whether or not *Melanconium lycopersici* would infect plants other than tomato. The following species of solanaceous plants were tested: Datura (*Datura alba* Nees), tobacco (*Nicotiana tabacum* L.), eggplant (*Solanum melongena* L.), malatalong (*Solanum verbascifolium* L.), tandang-aso (*Solanum torvum* Sw.), pepper (*Capsicum frutescens* L.), and Irish potato (*Solanum tuberosum* L.). The plants were grown in pots and sprayed with a spore suspension of the fungus. All other treatments given to the plants were the same as those employed in previous inoculation experiments. Control plants of each species were provided.

Of the seven species of solanaceous plants, Irish potato and Datura proved highly susceptible to the disease. Lesions produced on the vegetative parts of these plants were similar to those on tomato. Unpricked tobacco plants were not infected, but the disease was produced on the pricked plants under damp chamber conditions. The lesions stopped developing when the plants were transferred outside the laboratory. The rest of the species, injured and uninjured, were not infected despite repeated spraying with the spore suspension. Irish potato tubers and fruits of eggplant and pepper were inoculated in the laboratory. The eggplant fruits were rapidly infected, lesions having been produced in three to four days. The Irish potato tubers and the pepper fruits, however, proved to be resistant to the disease.

³ Seeds of this tomato strain were furnished by Dr. D. L. Umali of the Department of Agronomy.

LIFE HISTORY OF THE CAUSAL FUNGUS IN RELATION
TO PATHOGENESIS*Methods of living over from season to season*

Infected fruits and other plant parts left in the field after the tomato season usually contain an abundance of mycelium and conidia of the fungus. These mycelium and conidia may remain viable for as long as six months. During the next season, when weather conditions become favorable, they may infect the new tomato plantings.

The fungus may also remain dormant in tomato seeds which are being stored for the next planting season. Seeds which appear normal may actually harbor mycelium and conidia, especially if they have been obtained from diseased fruits. Such seeds when planted may germinate, but the plants that develop from them eventually become infected and serve as source of inoculum for other tomato plants in the field.

Methods of dissemination

In the tomato field, the conidia may be carried by surface wash during heavy rains and by spattering raindrops. Although the writers did not conduct any spore-catching experiment, they believe that the spores of the fungus can be disseminated by wind, especially in places where whirlwinds are frequent. It is very likely that insects breeding in normal and in rotting infected fruits of tomato also carry the spores of the organism. In transit and in storage, the disease may be spread by mixing healthy fruits with infected ones and by keeping healthy fruits in containers contaminated with the fungus.

Methods of infection

Inoculation experiments in which bearing tomato plants were used showed that *Melanconium lycopersici* is capable of infecting both uninjured and injured leaves, flowers, fruits and, to some extent, stems. Infection, however, was more readily secured by spraying the spore suspension on the wounded parts of the plant. It is probable that infection in the field commonly takes place through injuries caused by insects and by man during cultural operations.

CONTROL MEASURES

Sanitation

As soon as infection is noticed in the field, the affected tomato plants and fruits should be gathered in a pile, covered with inflammable materials, and burned to eradicate the pathogen. This will prevent the spread of the disease in the field. All tomato plant remains should be gathered and burned at the end of the tomato-growing season. This will eliminate sources of inoculum for the next tomato crop.

Crop rotation

A two- or three-year crop rotation with nonsolanaceous plants should be practiced if the field is infested with *Melanconium lycopersici*. Irish potato, Datura, and eggplant should not be planted before or after the tomato crop since these plants are susceptible to the tomato pathogen.

Selection and disinfection of seed

Only seeds obtained from healthy fruits should be used for planting. Since even healthy-looking seeds may harbor the pathogen, disinfecting the seeds before they are sown in the seedbed will prevent considerable loss of seeds and seedlings due to the disease. Soaking the seeds in a 1:1000 solution of mercuric bichloride for at least five minutes and washing them in two or more changes of sterile water is recommended. If seeds are to be stored, they should be dried, placed in air-tight containers, and kept in a cool, dry place.

Care in harvesting and packing of fruits

To minimize the disease, the grower or tomato picker should handle the tomatoes carefully during harvesting and packing. Rough handling may cause cuts or punctures on the rind of the fruits. These injuries serve as a ready entrance for the pathogen. Aside from careful handling, all fruits that are infected, no matter how slightly, should be discarded during the process of packing. This will greatly prevent healthy fruits from becoming contaminated and infected while in transit and in storage.

Use of fungicides

An experiment was conducted in the laboratory to determine the effectivity of two commercial fungicides against *Melanconium lycopersici*. The two fungicides were "530 Spraycop," a basic copper fungicide containing 53.0 per cent basic copper sulfate equivalent to metallic copper and 47.0 per cent inert ingredients, and "Fermate," an organic fungicide based on ferric dimethyl dithiocarbamate. The latter has been reported to be effective against anthracnose, caused by *Colletotrichum phomoides* (Sacc.) Chester, and leaf mold of tomato, caused by *Cladosporium fulvum* Cooke (Schroeder, 1947).

The results of the experiment (table 3) show that applications of "530 Spraycop" at 1.0 to 2.0 per cent concentrations and "Fermate" at 0.3 to 2.0 per cent concentrations, were all effective against the pathogen. From the standpoint of economy and prevention of spray injury, which may result from application of high concentrations of the fungicides, minimum protective dosage should be used. In this experiment, the writers found that the minimum concentrations which completely protected the tomato plants from the disease were 1.0 per cent for "530 Spraycop" and 0.3 per cent for "Fermate." Since the experiment was carried out on a very limited scale under

laboratory conditions, it cannot be stated definitely whether or not these concentrations will adequately protect tomato plants in the field. At present no definite statement can be given about the comparative efficiency of the two fungicides or the time and number of applications necessary.

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TABLE 1
Growth characteristics and conidial production of Melanconium lycopersici on various agar media

MEDIA	GROWTH CHARACTERISTICS	PRODUCTION OF CONIDIA	DIAMETER OF COLONY AFTER 6 DAYS *	AVERAGE DAILY GROWTH
Oatmeal agar	Fairly abundant mycelium produced within 24-48 hours, varying from white to dull white; culture medium changed from milky white to neutral gray.	Abundant	mm. 39.0	mm. 6.50
Tomato-decoction agar	Fairly abundant, white to dull-white growth produced within 24-48 hours; culture medium changed from cartridge buff to pale pinkish buff.	Fairly abundant	36.0	6.00
Onion agar	Fairly thin, whitish to dull-white mycelial growth produced within 24-48 hours; culture medium changed from pale olive-buff to tilleul buff.	Fairly abundant	35.0	5.83
Potato-dextrose agar	Very abundant, white to dull-white mycelium produced within 24-48 hours; culture medium changed from pale pinkish buff to pinkish buff.	Very abundant	29.0	4.83
Nutrient-dextrose agar	Very abundant, white to dull-white mycelium produced within 24-48 hours; culture medium changed from light vinaceous-fawn to vinaceous-buff.	Abundant	29.0	4.83
Nutrient agar	Fairly abundant white to dull-white mycelial growth produced within 48-72 hours; culture medium changed from pale brownish drab to light cinnamon-drab.	Fairly abundant	28.0	4.66
Corn-meal agar	Fairly thin, white to neutral-gray growth produced within 2-3 days; culture medium changed from pale brownish vinaceous to vinaceous-buff.	Scarce	26.0	4.33
Malt agar	Very scarce, white to neutral-gray growth produced within 2-3 days; culture medium changed from light cinnamon-drab to cinnamon-drab.	Scarce	26.0	4.33
Water agar	No growth produced.	None	—	—

* Average of three cultures.

TABLE 2

Growth and conidial production of Melanconium lycopersici on potato-dextrose agar of different hydrogen-ion concentrations

PH OF MEDIA	COMPARATIVE ABUNDANCE OF MYCELIUM	COMPARATIVE ABUNDANCE OF CONIDIA	DIAMETER OF COLONY AFTER 6 DAYS *	AVERAGE DAILY GROWTH
			mm.	mm.
1.4	None	None	—	—
2.4	None	None	—	—
3.4	Very scarce	None	7.3	1.21
4.4	Fairly abundant	Fairly abundant	23.0	3.83
5.4	Abundant	Very abundant	27.0	4.50
6.4	Abundant	Abundant	28.7	4.78
7.4	Abundant	Fairly abundant	30.7	5.11
8.4	Very abundant	Fairly abundant	29.7	4.95
9.4	Fairly abundant	Fairly abundant	26.0	4.33
10.4	Fairly abundant	Scarce	25.0	4.16

* Average of three cultures.

TABLE 3

Effects of spraying different concentrations of fungicides on tomato plants subsequently inoculated with Melanconium lycopersici

TRADE NAME AND CON- CENTRATION OF FUNGICIDE	NUMBER OF PLANTS INOCULATED	RESULTS
<i>530 Spraycop</i>		
Control (not sprayed with fungicide)	5	Severely infected
0.5%	5	Severely infected
0.7%	5	Slightly infected
0.8%	5	Slightly infected
0.9%	5	Slightly infected
1.0%	5	Not infected
1.5%	5	Not infected
2.0%	5	Not infected
<i>Fermate</i>		
Control (not sprayed with fungicide)	5	Severely infected
0.2%	5	Slightly infected
0.3%	5	Not infected
0.4%	5	Not infected
0.7%	5	Not infected
1.0%	5	Not infected
1.5%	5	Not infected
2.0%	5	Not infected

THE LIVE-POULTRY AND EGG MARKETS OF MANILA AFTER WORLD WAR II ¹

VITO F. DEL FIERRO, JR.

The retailing of live poultry and eggs in Divisoria, Quinta, and Paco markets from 1948 to 1949 was chiefly in the hands of women sellers. The live poultry handled consisted of chickens, Mallards (*itek*), Muscovy ducks (*bibi*), turkeys, pigeons, geese, and Guinea fowls. The eggs were fresh and salted duck eggs, both local and imported, and locally produced chicken eggs of native or imported breeds, particularly White Leghorn and New Hampshire.

The quantity of live poultry and eggs handled did not vary greatly from month to month. Seasonal fluctuations in the prices of these commodities were very slight, presumably because of regularity of supply. Prices were generally lower in Divisoria than in either Paco or Quinta market.

Cebu, Iloilo, Pangasinan, Batangas, and the Bicol provinces were the most important sources of the chickens. Ducks came primarily from Rizal, Pampanga, Bataan, and Laguna; turkeys came mostly from Pampanga, Rizal, Batangas, and Bulacan. Iloilo and the neighboring provinces of Manila supplied the pigeons, whereas Laguna, Bataan, Rizal, Cavite, and Pampanga were the principal sources of geese and guinea fowls. The locally produced chicken eggs came chiefly from Bulacan, Pangasinan, Pampanga, Rizal, and Cavite; the duck eggs came chiefly from Rizal and Laguna; and most of the imported duck eggs came from China.

The live poultry and eggs in these markets were not handled and shipped properly, although there were practically no losses from death of birds. The methods of selling and managing live poultry and of handling eggs need much improvement. The products were neither graded nor standardized.

The kinds of live poultry and eggs sold in the principal markets of Manila, the places where these products come from, the seasonal fluctuation of supply and demand of these products, and the prices at which they are sold deserve consideration. Hence, these were studied from December, 1948, to November, 1949, in Divisoria, Quinta, and Paco, three principal terminal markets for live poultry and eggs in Manila.

PROCEDURE

Fifty-two live-poultry stallholders operating 101 stalls and 44 egg stallholders operating 108 stalls cooperated in supplying most of the data used in this study. The live-poultry stallholders were distributed as follows: 27 in Divisoria, 15 in Quinta, and 10 in Paco. Twenty-five of the egg stallholders were in Divisoria, 10 in Quinta, and 9 in Paco.

¹ Central Experiment Station Contribution No. 1670. Thesis presented for graduation, October, 1951, with the degree of Bachelor of Science in Agriculture. Prepared in the Department of Animal Husbandry under the direction of Professor F. M. Fronda.

The questionnaire and survey methods of investigation were used in this study. Mimeographed questionnaires, especially prepared for this study, were distributed to the stallholders. Weekly trips to Manila were made to collect the filled questionnaires and to interview the stallholders personally. For additional data, other reliable persons engaged in the business were also interviewed. Records available in the Market Division of Manila, the Market Division of the Bureau of Commerce, and the Division of Foreign Trade Statistics of the Bureau of Census and Statistics were consulted.

RESULTS AND DISCUSSION

People in the business. Retailing of live poultry and eggs in the three markets surveyed was principally in the hands of women. For every man, there were three women who operated live-poultry stalls. Among the egg stallholders, the proportion of women to men vendors was 2:1. Apparently the business of selling is more a woman's job than a man's.

Kinds of live poultry handled. Chickens, Mallard ducks (*itek*), Muscovy ducks (*bibi*), turkeys, pigeons, geese, and Guinea fowls were the kinds of live poultry handled in Divisoria, Quinta, and Paco markets during the period covered by this study. The chickens, whether male or female, were grouped into five classes according to their approximate weight: first class, about one and one-half kilograms or more in weight; second class, about a kilogram to a kilogram and a half; third class, approximately three-fourths kilogram; and fourth class, from one-fourth to one-half kilogram. At the Divisoria market, there was a fifth class of chickens, the *popospasin*, which included very small weanlings used primarily as food for convalescents. Roosters, hens, pullets, cockerels, and weanlings were sold in the three markets; capons were not handled.

Unlike the chickens, Mallard ducks were not classified. The birds were mostly culls and, from their appearance, were at least three years old. In the case of Muscovies, the large old drakes were classified as first-class, and the females and young drakes, second-class.

Turkeys were classified into two groups on the basis of size. One group was composed of big, mature males, or toms; the other group was made up of females, or hens, and small toms. Extraordinarily large toms were classed as extras.

Pigeons were sold as squabs and as mature birds. In both groups the birds were classified according to size.

Geese and Guinea fowls were not so common in the market as the other kinds of poultry. Since these birds were handled in very small quantities only, no system of classification was followed.

Kinds of eggs sold. The different stallholders handled both imported and locally produced fresh duck eggs, locally produced fresh chicken eggs, and both imported and locally produced salted duck

eggs. The eggs sold were produced by native breeds, White Leghorns, and New Hampshires.

The eggs were sorted according to size and the color of the shell. Salted duck eggs are easily differentiated because the shells are brightly dyed. Eggs with cracked shells were handled separately. *Balut* and *penoy* were not sold in the stalls, but instead, they were peddled outside the market place.

Quantity of live poultry and eggs sold. The quantities of the different kinds of poultry and eggs handled monthly by 52 poultry stallholders and 44 egg stallholders in the three markets surveyed in Manila are shown in table 1. It may be noted that for live poultry, chickens were the most numerous and Guinea fowls, the least. The number of ducks, even when the two breeds were combined, ranked a very poor second to that of chickens.

The number sold of all kinds of poultry handled did not vary very much from month to month. The greatest number of chickens sold was in January, 1949, the total being 90,971 heads; the least was in July, 1949, when it amounted to 82,790 heads. The heaviest sale of Mallard ducks in the three markets was in December, 1948, and the least, in January, 1949; for Muscovy ducks, the highest sale was in November and the lowest in February, 1949.

Turkeys and pigeons had a small volume of sales in the months of June, July, and August; the volume was bigger in the latter part of the year. Geese and Guinea fowls were sold on the basis of order placements with the stallholders.

The quantity of eggs sold each month did not vary markedly. Fresh duck eggs were the most numerous, followed closely by fresh chicken eggs. More locally produced salted duck eggs were sold than imported ones.

Variation in prices. The prices of live poultry and eggs in the three markets fluctuated from month to month, but the fluctuations were not very great (table 2). First-class chickens were sold for as low as ₱3.65 each in March to as high as ₱4.90 in September. On the average, such chickens were bought for ₱3.73 and sold for ₱4.34, giving a margin of ₱0.77 for each. Prices also varied among classes of chickens for any month, the variation, of course, following the differences in weight.

Male Mallard ducks were generally priced slightly higher than the females, the range being from ₱2.25 in January and December to ₱3.30 in November for the males and from ₱2.30 in April, July, and September to ₱2.50 in June and October for the females. The average margin was ₱0.92 higher for males than for females.

The female Muscovy ducks cost less, the price ranging from ₱3.00 each in May to ₱3.90 in June and October; the price of males ranged from ₱3.20 in May to ₱6.20 in February. A favorable margin was also derived from the sale of male Muscovies.

Toms, or male turkeys, were sold at higher prices than females because males were generally bigger than the females. On the average, the males were bought at ₱8.20 each and sold at ₱16.58, leaving a margin of ₱8.35, whereas the female turkeys were generally bought at ₱6.19 each and sold at about ₱12.00. The ranges in price were ₱16.00 to ₱17.50 for males and ₱10.00 to ₱14.50 for females.

Squabs and mature pigeons did not differ very much in price. Both were sold at an average of ₱2.55 each. Geese, irrespective of sex, were the most expensive of all the live poultry. They were sold at an average of ₱23.58. Guinea fowls averaged ₱4.29 each, and as with geese, the price was quite steady throughout the year. The relative regularity of supply of the different kinds of live poultry seems to account for the slight variation in average monthly retail prices.

A comparison of the prices of eggs and live poultry in the three markets showed that prices in Divisoria were generally lower than those in either Paco or Quinta market, the prices in Paco market being the highest. The tendency of prices to be higher in the smaller markets than in Divisoria market as regards pork (Rodriguez)² seems to be corroborated by the present study with respect to the prices of poultry and eggs.

Sources of live poultry and eggs marketed. Live poultry sold in Manila came from various provinces of Luzon and Visayas. The most important sources of chickens were Iloilo, Cebu, Pangasinan, Negros Occidental, Bulacan, Rizal, Batangas, Nueva Ecija, Laguna, Quezon, Tarlac, Cavite, Isabela, Albay, and Sorsogon. Stallholders in Divisoria got most of their chickens from the Visayan provinces; those in Quinta, from Batangas, Rizal, Laguna, Bulacan, and Pangasinan; and those in Paco, from the Bicol region, Laguna, Batangas, Rizal, and Quezon.

Ducks came from Rizal, Pampanga, Bataan, and Laguna, and turkeys came mostly from Pampanga, Rizal, Batangas, and Bulacan. Iloilo and the neighboring provinces of Manila supplied the pigeons, whereas Laguna, Bataan, Rizal, Cavite, and Pampanga were the principal sources of geese and Guinea fowls.

Accessibility of the markets by particular means of transportation accounted for differences in place of origin of live poultry. Divisoria, for example, had more sources because it is readily accessible by rail, truck, or water.

The chief sources of locally produced chicken eggs were Bulacan, Pangasinan, Pampanga, Rizal, and Cavite. A large portion of the chicken eggs sold in Divisoria came from the Visayan provinces of Cebu, Iloilo, and Negros Occidental. In the Paco market, the eggs came from the southern Luzon provinces, and those in Quinta market from Batangas, Pangasinan, Rizal, Cavite, and Bulacan.

² RODRIGUEZ, E. 1926. A study of the pork supply in the city of Manila. *Philippine Agriculturist* 25: 233-241.

Duck eggs sold in Manila came principally from Rizal and Laguna, although a few came from Pampanga, Bataan, and Nueva Ecija. Imported duck eggs, fresh or salted, came from China, particularly from Shanghai and Hongkong. Some were imported from Indonesia. The locally produced eggs came from those provinces which were also the principal sources of the live poultry marketed in these three markets in Manila.

Handling and transporting of live poultry. Chickens from Cebu arrived at the piers in crates and were hauled to the market on Tuesdays and Saturdays. At the start of the survey in December, 1948, chickens from Iloilo, Negros, and Panay were shipped through the Philippine Air Lines every Monday and Wednesday. After October, 1949, however, the vendors found it unprofitable to send their products by air because of the increased rates. Thereafter, shipments were made by boat. From Pangasinan, chickens were brought daily to the markets by the Manila Railroad Company. From Tutuban Station the crates of chickens were loaded in pushcarts and brought to Divisoria.

Trucks from Batangas arrived at the Quinta market on Saturday afternoons and early Sunday mornings. These crates were received by stallholders to whom they had been consigned. On the other hand, chickens for the Paco market were brought by train on Friday and Wednesday mornings from Rizal, Quezon, and the Bicol provinces. From the Paco Station they were loaded in carretelas and brought to the market. On Saturday mornings, when only a few chickens were sold at the Paco market, the vendors went either to Divisoria or to Quinta market to get their supply.

Chickens were still unclassified when they reached the market. As soon as the crates arrived at Divisoria they were numbered consecutively and duplicates of these numbers were drawn by lot by the retailers. The crates of about the same size contained approximately the same number of chickens which varied in weight, age, and sex. The stallholders then classified the birds in the crates they had drawn according to their approximate weights. Irrespective of sex, after having been classified, the chickens were placed in separate coops which were piled several tiers high.

Ducks were placed in separate cages. In Quinta market there is a definite section for ducks. Fatness or leanness of the ducks is ordinarily judged by the feel of the throats of the birds. Ducks that remained unsold were given water-soaked corn and palay mixed with moistened rice bran. They were allowed free access to drinking water. Mallards tended to be overcrowded in the crates during shipment since they were ordinarily marketed in large numbers. As a result, the weak ones were sometimes smothered or failed to gain access to feed and water. When these birds died they were either dumped or thrown in garbage cans.

Turkeys usually had ready customers because orders for them were placed in advance for certain occasions. The birds were

shipped in crates larger than those used for chickens. Upon arriving in the market, they were placed in large coops and fed with whole corn grains. Sometimes the birds were just tied to the crates of chickens.

In the market, squabs were placed in small baskets, the floors of which were lined with rice straw to keep the squabs warm. They were fed individually. The beak of each bird was opened and soaked corn grains were dropped into the mouth. This was done until the crop was full; then the head was dipped in a deep can of water to allow the bird to drink.

Geese were usually sold in pairs. In the market they were confined in separate cages or in the cages occupied by the turkeys. They received the same treatment as that given to ducks. Like geese, Guinea fowls were displayed in the market awaiting the buyers who had ordered them.

The rate of mortality of live poultry handled in the three markets surveyed is shown in table 3. Losses from death of birds were practically nil, considering the large number of live poultry handled each month.

Handling of eggs in the market. Imported duck eggs which the vendors bought from Chinese importers were unpacked upon reaching the market. The eggs came in wooden boxes with a capacity of several thousands and in corrugated cardboard boxes accommodating several hundreds. The number varied according to the size of the box and the kind of eggs it contained. While the eggs were being unpacked, the broken eggs were removed. All the soiled eggs which had been smeared with egg contents were washed and scrubbed with *isis* leaves (*Ficus odorata* [Blanco] Merrill) to remove the hardened yolk. The eggs were then piled in baskets to dry. Unscrupulous vendors at times removed the mark "imported" from imported fresh duck eggs and sold them as local fresh duck eggs.

Native duck eggs were brought in bamboo baskets (*kaing*) packed with rice straw. Since the locally produced duck eggs were neither washed nor classified at their points of origin, they arrived in the market in a conglomeration of sizes, colors, and degrees of dirtiness. Rice hulls, mud, and feathers were usually found clinging to the shells. The eggs were therefore soaked in basins filled with water to soften the dirt and then scrubbed with *isis* leaves or with a piece of cloth. During the process of cleaning, the eggs were sorted as to size and placed in different baskets to dry.

Locally produced chicken eggs were relatively cleaner than duck eggs. A moistened cloth was used to remove the dirt adhering to the shells. The eggs were placed in shallow baskets to dry and were then displayed for sale.

TABLE 1

Quantities of different kinds of live poultry and eggs handled by 52 poultry stallholders and 44 egg stallholders in Divisoria, Quinta, and Paco markets, December, 1948, to November, 1949

COMMODITY	JAN.	FEB.	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT.	OCTOBER	NOV.	DEC.	TOTAL FOR THE YEAR
Live poultry:													
Chickens	90,971	86,640	85,258	87,350	85,499	88,664	82,790	86,592	84,182	86,925	90,548	89,707	1,045,126
Mallards (<i>Iték</i>) ...	750	765	970	871	849	791	859	842	907	980	996	1,092	10,672
Muscovy ducks													
(<i>Bibi</i>)	569	535	639	647	579	661	718	710	626	667	889	880	8,120
Turkeys	56	47	49	34	41	24	28	21	31	47	55	72	505
Pigeons	101	84	56	57	58	47	43	45	53	61	84	83	772
Geese	6	6	3	1	2	6	4	2	6	5	8	11	60
Guinea fowls	3	1	0	2	3	0	0	1	1	0	4	4	17
Eggs:													
Fresh duck eggs													
(local)	40,561	35,837	37,666	36,903	33,217	35,531	35,811	35,184	39,025	37,230	37,230	39,411	443,790
Fresh duck eggs													
(imported)	34,195	31,104	28,479	29,650	27,698	25,755	25,618	29,314	30,099	26,114	27,337	32,427	347,908
Salted duck eggs													
(local)	34,666	36,754	37,519	32,666	31,675	31,905	33,789	34,851	36,254	35,465	38,486	35,377	419,407
Salted duck eggs													
(imported)	28,716	30,735	25,525	19,802	19,912	28,052	27,884	27,580	26,987	25,908	31,533	32,707	325,341
Fresh chicken eggs													
(local)	41,262	39,986	40,885	26,707	32,822	30,878	32,618	29,561	32,114	26,294	28,439	36,776	398,342

TABLE 2

Average monthly retail prices of live poultry and eggs sold in the markets of Divisoria, Quinta, and Paco, December, 1949, to January, 1950

COMMODITY	JAN.	FEB.	MARCH	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	AVERAGE FOR THE YEAR		
													Buying Price	Selling Price	Margin
Live poultry: (a head)															
Chickens:															
1st class (1.5 kg. or more)	P4.50	P4.55	P3.65	P4.90	P4.20	P4.50	P4.50	P4.70	P4.90	P4.50	P4.50	P4.70	P3.73	P4.34	P0.77
2nd class (1.0-1.5 kg.)	2.50	2.55	2.50	2.70	2.90	2.65	2.75	2.80	2.70	2.65	2.65	2.65	2.45	2.66	0.21
3rd class (0.75-1.0 kg.)	1.70	1.70	1.75	1.90	2.00	2.00	2.00	2.00	2.20	2.00	2.00	1.75	1.67	1.91	0.24
4th class (0.50-0.75 kg.)	1.55	1.60	1.65	1.65	1.70	1.90	2.20	2.20	2.35	1.90	1.75	1.60	1.45	1.83	0.31
5th class (0.25-0.50 kg.)	1.50	1.55	1.55	1.55	1.50	1.65	1.70	1.70	1.75	1.65	1.60	1.50	1.47	1.60	0.13
Ducks:															
<i>Mek</i> (Mallard)															
Male	2.25	2.30	2.40	2.50	3.00	3.00	3.20	3.10	3.15	3.00	3.30	2.25	1.51	2.78	1.27
Female	2.35	2.40	2.40	2.30	2.40	2.50	2.30	2.40	2.30	2.50	2.40	2.35	2.33	2.38	0.35
<i>Bith</i> (Muscovy)															
Male	6.00	6.20	5.50	5.40	3.20	5.50	5.70	5.80	5.40	5.50	6.00	6.00	3.03	5.55	2.48
Female	3.25	3.50	3.20	3.70	3.00	3.90	3.50	3.50	3.50	3.90	3.20	3.20	2.77	3.44	0.66
Turkeys:															
Male	16.00	17.50	17.00	17.50	17.00	16.00	16.50	16.50	16.00	16.00	16.50	16.50	8.20	16.58	8.55
Female	10.00	11.00	12.00	13.00	12.00	12.00	13.00	13.50	14.50	12.00	10.00	10.00	6.19	11.99	5.72
Pigeons:															
Squabs	2.50	2.65	2.50	2.60	2.50	2.30	2.70	2.70	2.70	2.30	2.60	2.60	2.05	2.55	0.50
Adults	2.50	2.55	2.40	2.55	2.40	2.50	2.50	2.80	2.90	2.50	2.50	2.50	2.08	2.55	0.54
Geese:															
Male and female	25.00	25.00	20.00	25.00	25.00	20.00	25.00	25.00	25.00	20.00	25.00	25.00	15.38	23.75	8.16
Guinea fowls:															
Male and female	4.50	4.50	4.70	4.20	4.50	3.70	4.00	4.50	4.20	3.70	4.50	4.50	3.52	4.29	0.87
Eggs: (a dozen)															
Fresh duck eggs (local)	2.64	2.82	2.64	2.58	2.82	2.58	2.64	2.76	2.52	2.76	2.58	2.76	2.30	2.67	0.37
Fresh duck eggs (import- ed)	2.64	2.70	2.58	2.46	2.70	2.46	2.64	2.70	2.64	2.76	2.52	2.70	2.30	2.62	0.32
Salted duck eggs (local)	2.46	2.58	2.70	2.82	2.46	2.34	2.28	2.70	2.82	2.64	2.46	2.58	2.25	2.57	0.32
Salted duck eggs (import- ed)	2.52	2.46	2.58	2.64	2.58	2.40	2.34	2.58	2.70	2.58	2.58	2.46	2.25	2.53	0.28
Fresh chicken eggs (local)	2.28	2.16	2.28	2.52	2.52	2.40	2.34	2.46	2.40	2.52	2.40	2.34	2.20	2.38	0.18

TABLE 3
Mortality of the more commonly sold classes of live poultry in the markets surveyed

MONTHS	CHICKENS			DUCKS		PIGEONS			
	Total Number	Number Dead	Percentage of Mortality	Total Number	Number Dead	Percentage of Mortality	Total Number	Number Dead	Percentage of Mortality
January	91,048	77	0.08	1,354	35	2.58	101	1	—
February	86,736	96	0.11	1,342	42	3.13	87	3	3.45
March	85,343	85	0.10	1,659	30	1.83	60	4	6.67
April	87,406	56	0.06	1,524	6	0.39	61	4	6.56
May	86,558	59	0.07	1,452	24	1.65	60	2	3.33
June	88,715	51	0.06	1,479	27	1.83	49	2	4.08
July	82,833	43	0.05	1,601	24	1.50	45	2	4.44
August	86,627	35	0.04	1,570	18	1.15	49	4	8.16
September ...	84,225	43	0.05	1,565	32	2.04	57	4	7.02
October	86,985	60	0.07	1,674	27	1.61	62	1	1.61
November	90,626	78	0.09	1,925	40	2.08	90	6	6.67
December ...	89,784	77	0.09	1,989	17	0.85	89	6	6.74
Total	1,405,886	760	0.05	19,114	322	1.68	810	38	4.69

EFFECTS ON THE QUALITY AND AMOUNT OF FIBER EXTRACTED OF IMMERSING RAMIE STALKS IN WATER BEFORE DECORTICATION ¹

RAFAEL R. ARANETA, JR.

WITH THREE TEXT FIGURES

Fresh stalks of ramie varieties Saikeseisin, Formosa, Guiran Taipan No. 1, and Kogai immersed in water before decortication produced finer, softer, and lighter-colored fibers. In all the varieties, except Kogai, immersion significantly decreased the amount of fiber extracted. The tensile strengths of fibers from the fresh stems of Saikeseisin and Formosa were significantly greater than the tensile strengths of fibers from the treated stalks. No difference in tensile strength between the fibers of the fresh stalks and of the treated ones was obtained in Guiran Taipan No. 1 and Kogai.

Although there was a slight improvement in color and texture of the fibers obtained from fresh ramie stalks immersed in water, it did not compensate for the loss in the amount of fiber extracted and the weakening of the tensile strength.

Complete retting of ramie stalks by immersing them in water for days, as reported by Mauersberger (1947), produced fibers which contained 30 to 35 per cent gum.

David (1950) observed that fresh ramie stalks which had been soaked or partially retted in slow running water before they were decorticated produced cleaner, whiter, and softer fibers than those that were decorticated fresh.

To determine how immersion of fresh ramie stalks in water before decortication would affect the color, texture, amount, and tensile strength of the fibers produced, this study was conducted from November, 1950, to August, 1952, in the Fiber and Oil Division laboratory, Department of Agronomy.

MATERIALS AND METHODS

Two-year-old plants of ramie varieties Saikeseisin, Formosa, Guiran Taipan No. 1, and Kogai, introduced by Belisario in 1948 from Davao and later studied by Daza in 1950, were used in this experiment. Three replications of each variety were made.

The plants showed poor growth at the start of the experiment; hence, they were cut close to the ground on February 18, 1951, and were side-dressed with ammonium sulfate fertilizer applied at the rate of 200 kilograms to a hectare.

Each variety was harvested as soon as it had matured. The maturity periods of the different varieties are 65 days for Saikesei-

¹ Central Experiment Station Contribution No. 1671. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared under the direction of Dr. Pedro A. David.

sin, 80 days for Formosa and Guiran Taipan No. 1, and 90 days for Kogai (Belisario, 1949).

Four bundles of stalks were prepared from each plot, each bundle weighing about one kilogram. One bundle was used as the control, and the other three were immersed in a concrete tank provided with slow running water. The bundles were soaked in water for three to five days before decortication. These periods of partial retting were previously determined in preliminary tests conducted on January 3 and on June 24, 1951.

With the use of Lamotte's colorimeter, the pH value of the water in the retting tank was determined during each period of partial retting.

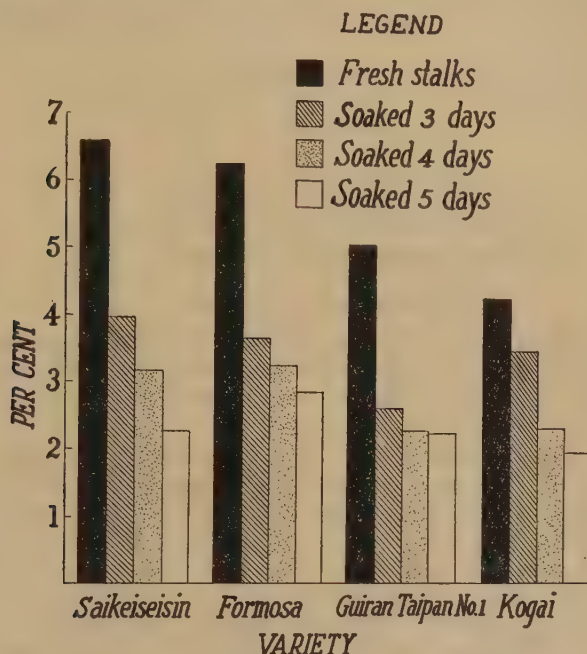


Fig. 1.—Comparative percentages of fibers obtained from fresh and from treated ramie stalks. (Percentages by varieties not statistically compared.)

With a Mayon decorticating machine run by a $1\frac{1}{2}$ to $2\frac{1}{2}$ h. p. engine, the control stalks were decorticated soon after harvest; the treated stalks, after each period of partial retting while they were still wet.

Immediately after decortication, the fibers from both the control and the treated stalks were soaked in a pail of fresh water. This procedure seems to prevent unnecessary discoloration of the fibers by air. The fibers were then washed thoroughly with laundry soap and water, after which they were dried in the sun.

An electrically operated Scott Testers IP-2 Tensilgraph machine was used to determine the breaking load of the fibers (fig. 1). Samples of single-fiber strands were prepared from the control and from the treated fibers. Five trials in each replication, or fifteen trials in each treatment, were made.

Inasmuch as weighing the individual fibers had been found, in previous trials, to be unreliable, the individual fiber being so light that repeated weighings of the same sample varied greatly, the five samples from each replication were weighed together. The average weight and the average breaking load of the five samples were taken, and the values obtained were used in computing the tensile strength.

The following formula, which was used by Botkin, Shires, and Smith (1943) to determine the tensile strength of bast fibers, was followed:

$$\text{Tensile strength} = \frac{\text{Breaking load}}{(\text{Wt. per cm.}) \times 100,000} = \text{km.}$$

where

breaking load is expressed in grams

weight per centimeter is expressed in grams

100,000 = centimeters per kilometer.

RESULTS AND DISCUSSION

General appearance of the plants. All the varieties exhibited fairly good growth after the plants had been cut back and fertilized. Leaf spot caused by *Cercospora boehmeriana* Wor.² was observed to affect slightly all the varieties.

Retting and decortication. In the preliminary tests, a period of from three to five days of soaking in tap water was found to be most convenient for decorticating purposes. Stalks which had been soaked for more than five days were difficult to decorticate because the prolonged soaking had made the stalks so weak that they were easily cut by the knife blades of the decorticating machine, with the result that only very short fibers were obtained. On the other hand, no improvement in color and in texture was noted in the fibers produced from stalks which had been soaked for less than three days.

The fresh stalks had to be fed twice to the machine before the bark and the pulp could be completely removed. The decortication of the soaked stalks was a little more difficult, for feeding the soaked stalks once into the machine did not remove the wood completely. Instead, the wood was flattened into ribbons, and much of the bark was left clinging to the fibers. The ribbons, therefore, had to be fed back several times to the machine before they could be completely decorticated. In the three-day treatment the treated stalks were passed thrice through the machine, and in both the four- and five-day treatments, four to five times.

² Identified by Dr. F. T. Orillo of the Department of Plant Pathology.

Table 1 shows the pH values of the retting water during the experiment. In the first preliminary test, when standing water was used, pH readings taken daily during the retting period showed a decrease from 6.9 to 5.1, or an increase in acidity. The color of the fibers produced from all the treatments ranged from pale brownish vinaceous to pallid mouse gray (table 3a). Since the increased acidity of the stagnant retting tap water might have contributed to the discoloration of the fibers, in the subsequent trials running water was used in retting the ramie stalks. In all the varieties from then on, the water remained fresh throughout the retting period.

Amounts of fiber obtained. Tables 2a, 2b, 2c, and 2d show the percentages of fibers, on fresh weight basis, extracted from the control and the treated stalks. In analyzing the percentage of extraction, the actual values were transformed into logarithms in accordance with the method of analyzing values in percentages (Snedecor, 1946).

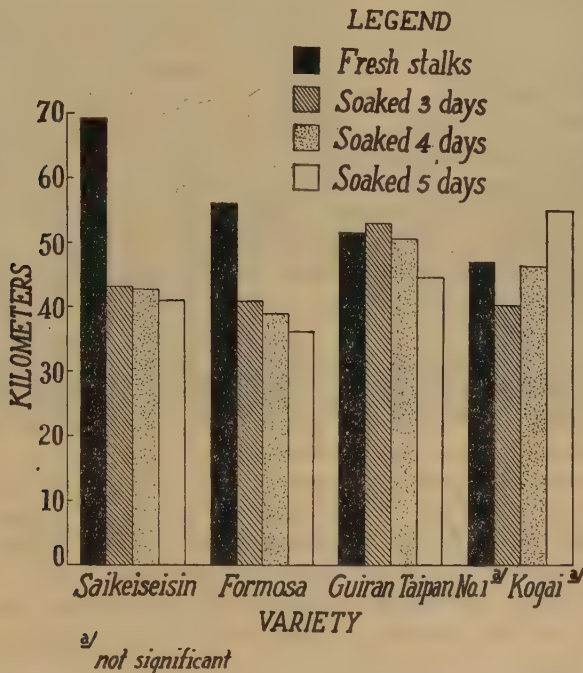


Fig. 2.—Comparative tensile strengths of ramie fibers obtained from fresh and from treated stalks. (Tensile strengths of varieties not statistically compared.)

The analyses of variance of these transformed values show that, except in Kogai where no differences between the control and the treated stalks or between treatments were found, the percentages of extraction in the soaked stalks were lower than the percentages in the unsoaked stalks. In Saikeseisin, the amount of dry fibers

obtained from the three-day treatment was 40 per cent less than that from the control stalks, in the four-day treatment 53 per cent less, and in the five-day period 65 per cent less. Formosa showed a loss of 42 per cent in the three-day treatment, 48 per cent in the four-day treatment, and 55 per cent in the five-day treatment. The amount of fiber lost by soaking in Guiran Taipan No. 1 was 48 per cent in the three-day treatment, 56 per cent in the four-day period, and 57 per cent in the five-day period. In general, the amounts of fiber extracted tended to decrease as the length of time of immersion was prolonged (fig. 2).

Color and texture of fibers. The fibers produced after partial retting were softer, finer, and lighter-colored than those obtained from the fresh stalks. A similar observation was reported by David in 1950.

Table 3b shows the comparative colors of the treated and untreated fibers of the four varieties. A close similarity in color of the fibers produced in all the treatments was noted between Guiran Taipan No. 1 and Kogai and between Saikeseisin and Formosa. Guiran Taipan No. 1 and Kogai had a deeper hue than either Saikeseisin or Formosa, but the treated and the untreated fibers of Guiran Taipan No. 1 had a lighter color than those of Kogai.

There was no discernible improvement in the color of the fibers extracted from the soaked Saikeseisin and Formosa stalks, but there was a very distinct improvement in the color of fibers obtained from the treated Guiran Taipan No. 1 and Kogai stalks as compared with those from their controls. This observation can be attributed to the fact that the fibers of both Saikeseisin and Formosa are by nature almost white.

In texture, the unsoaked stalks of Saikeseisin produced the softest fibers; Formosa produced the second best. These two varieties differed only slightly in texture. The fibers from the control stalks of Guiran Taipan No. 1 and Kogai had the same degree of softness. In the three-day treatment, the fibers of Guiran Taipan No. 1 and Kogai were as soft as those of Saikeseisin and Formosa, but in the four- and five-day treatments, only a very slight improvement in texture was noted in Guiran Taipan No. 1 and Kogai.

Based on color and texture, Saikeseisin can therefore be ranked first, Formosa a close second, Guiran Taipan No. 1 third, and Kogai last.

Tensile strength. No significant differences in tensile strength were found among the treated fibers or between the treated fibers and the control in both Guiran Taipan No. 1 and Kogai (tables 4c and 4d).

Table 4a shows the tensile strengths of the fibers obtained from the control and the soaked stalks of Saikeseisin variety. The average tensile strength of the control was very much greater than that of any of the treated fibers. In both the three-day and the four-day

soaking periods, the tensile strength was weaker by 38 per cent than that of the control; in the five-day treatment, by 44 per cent. There were no differences in tensile strength among the treatments.

In the Formosa variety, the average tensile strength of the control for the three replications was greater than that of any of the treated fibers. This variety showed a decrease in tensile strength of 27 per cent in the three-day soaking period, 30 per cent in the four-day treatment, and 34 per cent in the five-day treatment. No significant differences in tensile strength of the fibers obtained were noted among the treatments (table 4b).

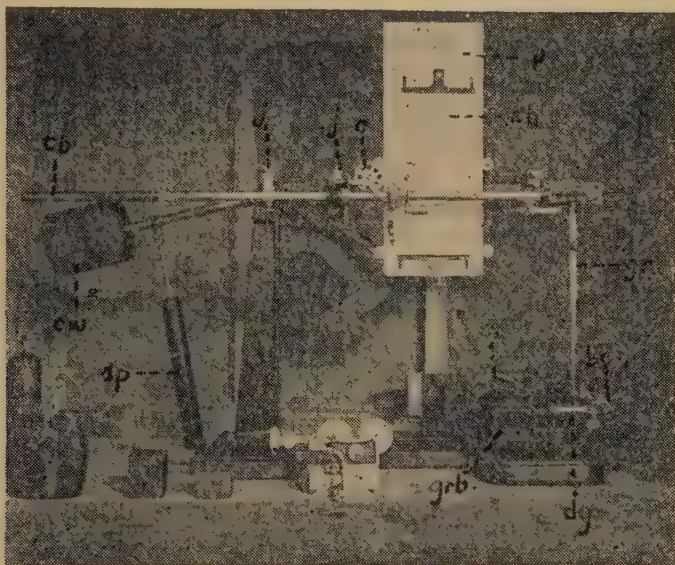


Fig. 3.—The Scott Testers IP-2 Tensilgraph machine used to determine the breaking load of ramie fiber, showing *tb* tilting beam, *j* jaw, *ch* chart, *c* carriage, *cw* counter weight, *dp* dash pot, *grb* gear reduction box, *m* motor, *dg* rack driving gear, *bch* bell crank handle, *gr* gear rack, and *p* platen. (Photographed by Dr. Julian Banzon of the Photographic Division.)

The tensile strengths of the control stalks of the Saikeseisin and Formosa varieties were statistically greater than those of the treated samples, whereas the three treatments produced fibers of practically the same tensile strength. Guiran Taipan No. 1 showed a tendency to decrease in tensile strength as the soaking period was prolonged. Kogai, on the other hand, surprisingly increased in tensile strength as the time of soaking was extended (fig. 3). When treated statistically, however, these values did not differ significantly. The effect of soaking on the tensile strength of the different varieties is graphically illustrated in figure 3.

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TABLE 1

The pH values of the retting water in the tank

TEST	pH READINGS				
	1st day	2nd day	3rd day	4th day	5th day
First preliminary trial (standing water used)	6.9	6.8	6.2	5.2	5.1
Second preliminary trial (running water used)	7.0	7.0	6.8	6.8	6.8
Experiment proper (running water used):					
Saikeseisin	7.2	7.0	7.2	7.3	7.3
Formosa	7.2	7.2	7.3	7.1	7.3
Guiran Taipan No. 1	7.2	7.2	7.3	7.2	7.5
Kogai	7.0	7.3	7.1	7.4	7.2

TABLE 2a

*Percentages of fiber obtained from the Saikeseisin variety
(fresh weight basis)*

TREATMENT	REPLICATION			TREATMENT TOTAL	TREATMENT MEAN
	I	II	III		
Control (fresh)	5.59	7.39	6.76	19.74	6.54
Three-day soaking	3.00	4.88	4.63	12.01	3.92
Four-day soaking	2.55	3.25	3.55	9.35	3.09
Five-day soaking	2.15	2.87	1.95	6.97	2.29

Logarithms of percentages

TREATMENT	REPLICATION			TREATMENT TOTAL	TREATMENT MEAN
	I	II	III		
Control (fresh)	0.7474	0.8686	0.8299	2.4459	0.8153
Three-day soaking	0.4771	0.6415	0.6656	1.7842	0.5937
Four-day soaking	0.4065	0.5119	0.5502	1.4686	0.4895
Five-day soaking	0.3324	0.4579	0.2900	1.0803	0.3601
Replication total	1.9634	2.4799	2.3357	6.7790	

*Analysis of variance
(Log values)*

SOURCE OF VARIATION	DF	SS	MS	F	TABULAR F	
					5%	1%
Replication R	2	0.0356	0.178	34.43	4.76	9.78
Treatment T	3	0.3336	0.1112			
R × T	6	0.0194	0.0032			
Total	11	0.3886	0.			

L.S.M.D. = 2.29

TABLE 2b

*Percentages of fiber obtained from the Formosa variety
(fresh weight basis)*

TREATMENT	REPLICATION			TREATMENT TOTAL	TREATMENT MEAN
	I	II	III		
Control (fresh)	6.42	6.43	5.94	18.79	6.26
Three-day soaking	4.16	3.37	3.94	11.47	3.64
Four-day soaking	3.58	2.69	3.56	9.83	3.25
Five-day soaking	2.62	2.59	3.31	8.52	2.82

Logarithms of percentages

TREATMENT	REPLICATION			TREATMENT TOTAL	TREATMENT MEAN
	I	II	III		
Control (fresh)	0.8075	0.8082	0.7738	2.3895	0.7965
Three-day soaking	0.6191	0.5276	0.5955	1.7422	0.5607
Four-day soaking	0.5539	0.4298	0.5514	1.5351	0.5117
Five-day soaking	0.4183	0.4133	0.5198	1.3514	0.4505
Replication total	2.3788	2.1789	2.4405	7.0182	

*Analysis of variance
(Log values)*

SOURCE OF VARIATION	DF	SS	MS	F	TABULAR F	
					5 %	1 %
Replication R	2	0.0099	0.0050	22.49	4.76	9.78
Treatment T	3	0.2047	0.0682			
R $\times$ T	6	0.0126	0.0021			
Total	11	0.2272				

L.S.M.D. = 2.23

TABLE 2c

*Percentages of fiber obtained from the Guiran Taipan No. 1 variety
(fresh weight basis)*

TREATMENT	REPLICATION			TREATMENT TOTAL	TREATMENT MEAN
	I	II	III		
Control (fresh)	4.95	5.09	5.09	15.13	5.04
Three-day soaking	2.28	2.91	2.65	7.84	2.60
Four-day soaking	2.16	2.34	2.21	6.71	2.24
Five-day soaking	2.04	2.02	2.41	6.47	2.15

Logarithms of percentages

TREATMENT	REPLICATION			TREATMENT TOTAL	TREATMENT MEAN
	I	II	III		
Control (fresh)	0.6946	0.7067	0.7067	2.1080	0.7027
Three-day soaking	0.3579	0.4639	0.4232	1.2450	0.4150
Four-day soaking	0.3345	0.3692	0.3444	1.0481	0.3494
Five-day soaking	0.3096	0.3054	0.3920	0.9970	0.3323
Replication total	1.6966	1.8452	1.8563	5.3981	

*Analysis of variance
(Log values)*

SOURCE OF VARIATION	DF	SS	MS	F	TABULAR F	
					5%	1%
Replication R	2	0.0040	0.0020	89.00	4.76	9.78
Treatment T	3	0.2671	0.0890			
R × T	6	0.0062	0.0010			
Total	11	0.2773				

L.S.M.D. = 2.08

TABLE 2d

*Percentages of fiber obtained from the Kogai variety
(fresh weight basis)*

TREATMENT	REPLICATION			TREATMENT TOTAL	TREATMENT MEAN
	I	II	III		
Control (fresh)	4.56	4.29	4.28	13.13	4.28
Three-day soaking	3.13	3.52	3.60	10.25	3.41
Four-day soaking	3.18	1.29	2.61	7.08	2.20
Five-day soaking	2.11	2.53	1.45	6.09	1.98

Logarithms of percentages

TREATMENT	REPLICATION			TREATMENT TOTAL	TREATMENT MEAN
	I	II	III		
Control (fresh)	0.6590	0.6325	0.6314	1.9929	0.6309
Three-day soaking	0.4955	0.5465	0.5563	1.5983	0.5228
Four-day soaking	0.5024	0.1106	0.4166	1.0296	0.3432
Five-day soaking	0.3243	0.4031	0.1614	0.8888	0.2963
Replication total	1.9812	1.6927	1.7659	5.4396	

*Analysis of variance
(Log values)*

SOURCE OF VARIATION	DF	SS	MS	F	TABULAR F	
					5%	1%
Replication R	2	0.0112	0.0056	4.39 ^a	4.76	9.78
Treatment T	3	0.2349	0.0783			
R × T	6	0.1067	0.0178			
Total	11	0.3528				

^a Not significant.

TABLE 3a

Colors of ramie fibers produced in the first preliminary trial

TREATMENT	VARIETY			
	Saikeiseisin	Formosa	Guiran Taipan No. 1	Kogai
Control	light tilleul buff	light tilleul buff	deep olive-buff	deep olive-buff
One-day soaking	light vinaceous-buff	light tilleul buff	deep olive-buff	deep olive-buff
Two-day soaking	light tilleul buff	light tilleul buff	olive-buff	deep olive-buff
Three-day soaking	pale brownish vinaceous	pale grayish vinaceous	pale vinaceous-fawn	pale vinaceous-fawn
Four-day soaking	pale brownish vinaceous	pale grayish vinaceous	pale vinaceous-fawn	pale vinaceous-fawn
Five-day soaking	pallid mouse gray	pallid mouse gray	pallid mouse gray	deep tint of mouse gray
Six-day soaking	pallid mouse gray	pallid mouse gray	pallid mouse gray	deep tint of mouse gray
Seven-day soaking	pallid mouse gray	pallid mouse gray	pallid mouse gray	deep tint of mouse gray

TABLE 3b

Colors of ramie fibers produced in the experiment proper

TREATMENT	VARIETY			
	Saikeiseisin	Formosa	Guiran Taipan No. 1	Kogai
Control	white with a medium to light tint of buff	white with a medium to light tint of buff	pale olive-buff to a medium tint of brown	deep olive-buff to a deep tint of brown
Three-day soaking	white with a light tint of buff	white with a light tint of buff	light pale olive-buff	pale olive-buff to pale mouse gray
Four-day soaking	white with a delicate tint of buff	white with a delicate tint of buff	light tint of olivaceous-brown	light tilleul buff to a light tint of mouse gray
Five-day soaking	white with a delicate tint of buff to almost white	white with a delicate tint of buff to almost white	light tint of olivaceous-brown	medium to light tint of olivaceous-brown to a very pale olive-gray

TABLE 4a

Tensile strengths of fibers produced from fresh and treated stalks of Saikeiseisin variety (in kilograms)

TREATMENT	REPLICATION			TREATMENT TOTAL	TREATMENT MEAN
	I	II	III		
Control (fresh)	59.39	63.25	85.89	208.53	69.51
Three-day soaking	45.70	36.51	47.89	129.70	43.23
Four-day soaking	43.68	45.70	35.28	129.66	43.22
Five-day soaking	33.03	38.24	46.18	117.45	39.15
Replication total	186.80	183.70	214.84	585.34	

Analysis of variance

SOURCE OF VARIATION	DF	SS	MS	F	TABULAR F	
					5%	1%
Replication R	2	147.60	73.80	6.61	4.76	9.78
Treatment T	3	1752.45	584.15			
R × T	6	530.30	88.38			
Total	11	2430.35				

L.S.M.D. = 18.76

TABLE 4b

Tensile strengths of fibers produced from fresh and treated stalks of Formosa variety (in kilograms)

TREATMENT	REPLICATION			TREATMENT TOTAL	TREATMENT MEAN
	I	II	III		
Control (fresh)	55.27	60.72	52.19	168.18	56.06
Three-day soaking	39.33	42.48	41.04	122.85	40.95
Four-day soaking	33.39	40.43	43.43	117.25	39.08
Five-day soaking	40.35	37.32	32.88	110.55	36.85
Replication total	168.34	180.95	169.54	518.83	

Analysis of variance

SOURCE OF VARIATION	DF	SS	MS	F	TABULAR F	
					5%	1%
Replication R	2	24.22	12.11	12.88	4.76	9.78
Treatment T	3	683.12	227.71			
R × T	6	106.10	17.68			
Total	11	813.44				

L.S.M.D. = 8.34

TABLE 4c

*Tensile strengths of fibers produced from fresh and treated stalks of Guiran
Taipan No. 1 variety (in kilograms)*

TREATMENT	REPLICATION			TREATMENT TOTAL	TREATMENT MEAN
	I	II	III		
Control (fresh)	53.13	50.21	52.28	154.62	51.54
Three-day soaking	51.21	58.51	51.31	161.03	53.68
Four-day soaking	56.53	58.40	36.80	151.73	50.58
Five-day soaking	37.78	53.55	42.32	133.65	44.55
Replication total	197.65	220.67	182.71	601.03	

Analysis of variance

SOURCE OF VARIATION	DF	SS	MS	F	TABULAR F	
					5%	1%
Replication R	2	182.84	91.42			
Treatment T	3	137.68	45.89	1.00 a	4.76	9.78
R × T	6	274.82	45.80			
Total	11	595.34				

^a Not significant.

TABLE 4d

Tensile strengths of fibers produced from fresh and treated stalks of Kogai variety (in kilograms)

TREATMENT	REPLICATION			TREATMENT TOTAL	TREATMENT MEAN
	I	II	III		
Control (fresh)	33.08	56.64	51.12	140.84	46.95
Three-day soaking	43.68	47.33	32.26	123.27	41.09
Four-day soaking	50.29	44.98	44.31	139.58	46.53
Five-day soaking	54.18	54.85	56.18	165.21	55.07
Replication total	181.23	203.80	183.87	568.90	

Analysis of variance

SOURCE OF VARIATION	DF	SS	MS	F	TABULAR F	
					5%	1%
Replication R	2	76.13	38.05	1.58 ^a	4.76	9.78
Treatment T	3	279.13	99.04			
R × T	6	376.39	62.73			
Total	11	749.65				

^a Not significant.

THE RETAILING OF FRESH FRUITS AND VEGETABLES IN THE PUBLIC MARKET OF CALAMBA, LAGUNA ¹

LILIA V. HOSILLOS

Fifty-one kinds of vegetables and 33 of fruits were carried in stock by the retailers in the public market of Calamba, Laguna, during the year 1951. The total number of available kinds of vegetables ranged from 31 in February to 45 in November, indicating that the fourth quarter of the year was the season for most vegetables. With fruits, the number ranged from 14 in April and November to 22 in August, showing that most of the fruits were in season during the third quarter of the year. Based on the proportion of each kind of fruit and vegetable to the monthly total quantities handled aggregately by the retailers, the seasonal kinds were the most abundant during particular months of the year. The average monthly receipts of each retailer amounted to P393 for vegetables and P360 for fruits.

Only about one-third of the total stock of fruits and vegetables came from the different barrios of Calamba. Two-thirds of the supply came from Batangas, Manila and suburbs, Baguio, Barrio Alabang of Muntinlupa in Rizal, and other towns of Laguna. Trucks, trains, calesas, carts, and pack animals were used in transporting the products from these sources to the market place of Calamba.

The retail prices of fruits and vegetables varied widely from season to season and from month to month throughout the year, the fluctuations being greater in the relatively more perishable or seasonal kinds of both commodities. Prices were observed to have been greatly influenced by supply and demand. Custom, the quality of the products, and government regulations also affected the prices. Prices of vegetables were generally low in February and March and from August to October and were high from April to July. Prices of fruits were generally high in February, March, August, and September and were low from April to June and from November to December.

The most important problems of retailing were lack of proper storage facilities, overstocking of commodities, small volume of business, and lack of adequate or accurate market information.

Every town in the Philippines has at least one public market, which is the most common source of food products for Filipino homes. Almost all the transactions are retail and generally on a cash-and-carry basis.²

To study the problems involved in the retailing of fresh fruits and vegetables in the public market of Calamba, Laguna, and to determine the kinds, sources of supply, and variations in prices and in quantities sold, this investigation was undertaken from December,

¹ Central Experiment Station Contribution No. 1672. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture, April, 1952. Prepared in the Department of Agricultural Economics under the direction of Instructor Nathaniel B. Tablante.

² Tablante, N. B. 1950. Retail outlets for the farmer's products. *Agricultural and Industrial Life* 12 (10): 20-21.

1950, to January, 1952. Calamba was chosen for this study because, being easily accessible by land- and water-transportation facilities, its public market is one of the largest markets in Laguna, and is an important retail outlet for the farm products grown in neighboring towns.

Fifty retailers selling locally grown fresh vegetables and fruits and occupying permanent market stalls were interviewed weekly for a period of one year. With the use of mimeographed copies of a questionnaire which had been prepared in the Department of Agricultural Economics, information on the kinds of products handled, the sources, the retail prices, and other pertinent data were gathered from these retailers.

DISCUSSION OF RESULTS

Kinds and quantities of fresh fruits and vegetables sold. The most important Philippine vegetables and fruits had a good coverage in the public market of Calamba, Laguna, during the year 1951. Fifty-one kinds of fresh vegetables were carried in stock by the average retailer. These were grouped as follows: 3 kinds of flowers and shoots; 16 of fruits; 15 of leaves and tops; 9 of roots, tubers, or bulbs; and 8 of legumes. Only 25 different kinds, however, were available throughout the year. The most important of these were ampalaya, cabbage, pechay, lettuce, mustard, garlic, onions, eggplant, upo, Chinese celery (kinchay), kuchay, chayote, kangkong, squash, sweet potato roots, and mungo. The number of available kinds ranged from 31 in February to 45 in November. During the rainy season, only a relatively small number of kinds were available.

Based on the proportion of each kind of vegetable to the total quantities handled aggregately each month by the 50 retailers, tugui was the most important vegetable sold in January, tomatoes in February, kulitis in March, melon in April, watermelon in May, bamboo shoots in June, July, and August, string beans (sitao) in September, garlic in October, squash in November, and peas (chicharro) in December. Except for garlic and squash, these vegetables were all seasonally produced. Generally, the kinds available during the entire year exhibited a more or less constant pattern of fluctuation as regards quantities.

Comparatively fewer kinds of fruits than of vegetables were retailed in the public market of Calamba. Only 33 kinds of fruits were sold during the year. Of these, bananas, calamondin, guava, and papaya were available during the entire year; the others were seasonal and were found in the market for two months to eight months at most. Twenty-two kinds of fruits were sold in August, and only 14 in April and November.

As with vegetables, the seasonal fruits comprised the largest portion of the total monthly quantities handled. Tiesa made up the biggest part of the total available supply of fruits in January and

February, star apple (caimito) in March, duhat in April, lime (dayap) in May, Carabao mango in June, avocado in July, makopa in August, mabolo in September, pummelo (suha) in October, naranjita in November, and ripe tamarind in December.

Most of the fruits were in season during the third quarter of the year; most of the vegetables, during the last quarter, particularly in November. Sugar apple (atis), avocado, breadfruit (rimas), jakfruit, lime, makopa, mango, pineapple, and santol were in season during the midyear. Balimbing, tiesa, cashew, chico, duhat, kamanchile, star apple, siniguelas, and tamarind were available during the first half of the year; and guayabano, chico, lanzones, mabolo, and citrus, in the later part of the year.

Fruits and vegetables followed the same pattern of distribution. The majority were abundant or relatively scarce for a certain period of the year so that the variation in quantities handled each month reflected the seasonal nature of production. The quantity of vegetables handled was observed to have a wider fluctuation than that of fruits, and the more perishable the kind of fruit or vegetable was, the larger the variation in the volume of monthly supply.

Based on the average monthly sales of each retailer, the ten leading vegetables in the order of importance were watermelon, melon, celery, cauliflower, garlic, carrots, peas, cabbage, pechay, and Bermuda onion (table 1). These vegetables accounted for more than 68 centavos of each peso spent monthly for vegetables in these stores. If eggplant, kangkong, wax gourd (kondol), patola, radish, sweet potato roots, sweet pepper, tomatoes, bamboo shoots, and cowpea were added, the 25 leading vegetables would account for 90 centavos of every peso spent each month for vegetables. The sale of watermelon, the highest ranking vegetable in terms of average monthly sales, was almost thrice greater than that of the next ranking kind, melon, and represented ₱102 of the monthly total receipts of ₱393 of a retailer.

On a similar basis, Carabao mango, star apple, lanzones, pummelo, papaya, Lacatan banana, Buñgulan banana, jakfruit, Pico mango, and chico were the ten ranking fruits (table 2). These ten gave a total of ₱249 a month to the retailer, or more than two-thirds of the monthly total receipts from fruits, which amounted to ₱360. The three leading fruits alone, Carabao mango, star apple, and lanzones, accounted for almost one-third of the monthly total sales.

Sources and market outlets of fresh fruits and vegetables. Only one-third of all the kinds of fresh vegetables and fruits marketed in Calamba came from the town itself and the neighboring farms. Two-thirds of the supply came from Batangas, Manila and suburbs, Baguio, Barrio Alabang of Muntinlupa in Rizal, and other towns of Laguna.

Tanauan, Batangas, supplied the multiplier onions and garlic. Vegetables, such as cabbage, carrots, cauliflower, and celery, came

from Baguio. Most of the leafy kinds, such as Chinese celery, lettuce, mustard, pechay, chive, sweet pepper, and kondol, were produced in Manila and its suburbs.

The supply of melon and watermelon came from Barrio Alabang, Muntinlupa, Rizal. Some Laguna towns, principally Santa Maria, Paete, Pagsanjan, and Lumban, supplied all the lanzones fruits, bananas, atis, avocado, jakfruit, papaya, and chico. Mango was supplied by Alabang, Muntinlupa, and by Paete; pineapple, by Calauan, Laguna, and several towns in Cavite, principally Indang, Silang, and Amadeo. Citrus fruits were principally supplied by Batangas, but some came from Laguna. The fruits were transported from these sources by means of trucks and trains.

According to Tablante and Tirona,³ the wholesalers who regularly supply the retailers of Cavite market with fresh fruits and vegetables also feed a large number of retail outlets, like retailers of other towns in Rizal and Laguna.

Quality of products sold. In grading the fruits and vegetables sold at retail, an arbitrary subjective classification had to be adopted in the absence of established and recognized standards. The bases used for grading vegetables were general appearance, absence of blemishes caused by rough handling or improper packing, and freshness; those for fruits were size, uniformity of shape and color, absence of mechanical injuries on the surface, and relative freshness.

It was observed that only a very small portion of the fresh vegetables and fruits marketed in Calamba was of good quality. A large portion was classified fair. The poor quality of the commodities sold was due to improper crating or packing, careless handling on the part of seller and of buyer, and transportation difficulties. Even the commodities produced in or about Calamba and those relatively durable enough to withstand long-distance hauling and rough handling could hardly be classified excellent.

The keeping quality of perishable fruits and vegetables varied greatly. The range was from two days for chico, caimito, cashew, avocado, atis, and kamanchile to twelve days for most varieties of the citrus family. The range for vegetables was wider, from one day for leafy vegetables, like pechay, lettuce, mustard, and malunggay, to three to six months for mungo and garlic. Lower prices were offered for products which had lost their freshness but which were still good for consumption. The spoiling percentage of a week's supply of vegetables ranged from one to eight per cent: that is, for every 10 kilos, the spoilage was from 0.1 to 0.8 kilo.

Stocks were usually changed on Mondays and Thursdays, Tuesdays and Fridays being the principal market days.

³ Tablante, N. B., and E. E. Tirona. 1951. Retailing of fresh fruits and vegetables in the public market of Cavite City. *Philippine Agriculturist* 35: 358-567.

The most important problems in retailing perishables were lack of proper storage facilities, overstocking, and lack of adequate market information. Cooperative refrigeration, with each retailer sharing the costs of operation on the basis of his use of the facilities, can be suggested as a solution to these problems, but the volume of business of these sellers will not warrant such an expensive plan. Moreover, the consumers, it was noticed, preferred the unrefrigerated, newly harvested products to the refrigerated kinds.

Variation in prices. Tables 3 and 4 show the average monthly retail prices of the vegetables and fruits sold in the Calamba public market. The prices were not constant throughout the year, but fluctuated from month to month and from season to season. The prices of vegetables were generally low in February, March, August, September, and October and high in April, May, June, and July. Fruits generally cost more in February, March, August, and September and less in April, May, June, November, and December.

The coefficient of average seasonal price fluctuation was used to measure the seasonal price movements. This is derived as a percentage by dividing the difference between the highest and lowest average monthly prices by the average of the two prices. The prices of vegetables fluctuated slightly less than the prices of fruits, the average coefficient being 47.5 per cent for vegetables and 49 per cent for fruits.

Of the different groups of vegetables, legumes had the highest average coefficient, 66.9 per cent, followed by flowers and shoots, 57.3 per cent; fruits, 47.5 per cent; leafy vegetables, 39.9 per cent; and roots, tubers, and bulbs, 37.8 per cent, the lowest. The ten vegetables and fruits with the highest coefficients were calamondin, 149.4 per cent; string beans, 125 per cent; melon, 118.0 per cent; tugui, 105.3 per cent; kangkong, 95.6 per cent; chayote, 94.6 per cent; patani, 93.3 per cent; siniguelas, 92.9 per cent; guava, 89.8 per cent; and kinchay, 89.3 per cent. Most of the commodities with high seasonal price variations were relatively either more perishable or more seasonal than the rest. These observations corroborate the finding of Shepherd that the "prices of perishable crops can be expected to fluctuate reasonably more than the prices of the more durable crops."⁴

It was noted that the fluctuation of actual prices paid appeared small. The difference, however, was magnified because of the very low prices of the products.

Small retailers who did not occupy permanent stalls and who sold only occasionally small quantities of fruits and vegetables generally charged lower prices than those who occupied permanent stalls. These small retailers sometimes produced the commodities they sold and, therefore, could afford to sell their products at a relatively

⁴ SHEPHERD, GEOFFREY S. 1941. *Agricultural-price analysis*. viii + 402 p. Ames, Iowa: The Iowa State College Press.

lower price. Moreover, their overhead expenses were comparatively low since they paid lower stall rentals than those occupying permanent stalls.

In general, the retail prices of fruits and vegetables in the public market of Calamba were relatively lower than those prevailing for similar kinds in the public market of Cavite City, as reported by Tablante and Tirona.⁵

The forces of supply and demand explain the seasonal behavior of the prices of fruits and vegetables. Assuming the demand to be constant, the relationship between prices and quantities offered for sale is generally inverse: that is, when the supply is great, the price is generally low and vice versa.

There were, however, factors other than the seasonal variation in production and, consequently, in supply which affected the variation in prices. In December, the prices of fruits and vegetables were high because of the Christmas season; hence, even if there had been a large supply, the prices would have still tended to be high since the demand was relatively greater than the supply. Another factor was the regulation of prices by custom and the government. Some commodities were sold at practically the same price throughout the year because of the prevalence of customary prices and a government ceiling. The quality of the products sold also influenced the prices. Other things being equal, products of relatively better quality were sold at higher prices.

APPENDIX A

Common and scientific names of important Philippine fruits

- Atis, *Annona squamosa* Linn.
- Balimbing, *Averrhoa carambola* Linn.
- Breadfruit (rimas), *Artocarpus communis* Forst.
- Canistel (tiesa), *Lucuma nervosa*, A. DC.
- Cashew, *Anacardium occidentale* Linn.
- Chico, *Achras zapota* Linn.
- Calamondin, *Citrus Microcarpa* Linn.
- Duhat, *Syzygium cumini* (Linn.) Skeels
- Guayabano, *Annona muricata* Linn.
- Guava, *Psidium guayava* Linn.
- Jakfruit, *Artocarpus heterophyllus* Lam.
- Kamanchile, *Pithecolobium dulce* (Roxb.) Benth.
- Kamias, *Averrhoa bilimbi* Linn.
- Lanzones, *Lansium domesticum* Jack.
- Lime (dayap), *Citrus aurantiifolia* Christmann Sw.
- Mabolo, *Diospyros discolor* Willd.
- Makopa, *Syzygium samarangense* Blume Merr. & Perry
- Mango, *Mangifera indica* Linn.
- Naranjita, *Citrus nobilis* Lour.
- Pummelo, *Citrus grandis* Osbeck
- Santol, *Sandoricum koetjape* (Burm. f.) Merr.
- Star apple (caimito), *Chrysophyllum cainito* Linn.
- Siniguelas, *Spondias purpurea* Linn.
- Tamarind, *Tamarindus indica* Linn.

⁵ Tablante and Tirona, *op. cit.*

APPENDIX B

Common and scientific names of important Philippine vegetables

Vegetables: Fruits

- Ampalaya, *Momordica charantia* Linn.
- Upo, *Lagenaria leucantha* (Duch.) Rusby
- Chayote, *Sechium edule* (Jacq.) Sw.
- Wax gourd (kondol), *Benincasa hispida* (Thumb.) Cogn.
- Okra, *Hibiscus esculentus* Linn.
- Pepper, *Capsicum frutescens* Linn.
- Patola, *Luffa cylindrica* Linn.

Vegetables: Leaves

- Ampalaya, *Momordica charantia* Linn.
- Celery, *Apium graveolens* Linn.
- Chinese celery (kinchay), *Apium graveolens* Linn.
- Chive (kuchay), *Allium tuberosum* Roxb.
- Kulitis, *Amaranthus viridis* Linn.
- Malunggay, *Moringa oleifera* Lam.
- Pechay, *Brassica pekinensis* (Lour.) Rupr.

Vegetables: Roots, tubers, and bulbs

- Radish, *Raphanus sativus* Linn.
- Gabi, *Colocasia esculenta* (Linn.) Schott
- Singkamas, *Pachyrrhizus erosus* (Linn.) Urb.
- Tugui, *Dioscorea esculenta* (Lour.) Burkill

Vegetables: Legumes

- Cowpea, *Vigna sinensis* (Linn.) Endl.
- Habichuelas, *Phaseolus vulgaris* Linn.
- Kalamismis, *Psophocarpus tetragonolobus* Linn. D.C.
- Patani, *Phaseolus lunatus* Linn.
- Togue (mungo sprouts), *Phaseolus aureus* Roxb.
- Pea (chacharo), *Pisum sativum* Linn. var. *macrocarpon* Ser.
- Sitao (string beans), *Vigna sesquipedalis* W. F. Wight

TABLE 1

Relative importance of each kind of vegetable on the basis of average monthly sales of each retailer from January to December, 1951, in Calamba, Laguna

RANK	VEGETABLE	NUMBER OF MONTHS AVAILABLE	AVERAGE MONTHLY SALES	PERCENTAGE OF TOTAL
			<i>pesos</i>	
1	Watermelon	4	102.46	26.05
2	Melon	4	34.43	8.75
3	Celery	3	31.19	7.93
4	Cauliflower	7	21.42	5.45
5	Garlic	12	19.08	4.85
6	Carrots	8	16.74	4.25
7	Peas (chicharo)	5	15.42	3.92
8	Cabbage	12	11.39	2.90
9	Pe-tsai	12	8.64	2.20
10	Onion, Bermuda	12	8.40	2.14
11	Eggplant	12	8.14	2.07
12	Kangkong	12	8.13	2.07
13	Kondol	6	7.34	1.87
14	Patola	6	6.36	1.62
15	Radish	8	6.36	1.62
16	Sweet potato leaves	12	6.13	1.56
17	Upo	12	5.93	1.51
18	Onion, multiplier	12	5.82	1.48
19	Mustard	12	5.03	1.28
20	Kinchay	12	4.81	1.22
21	Sweet potato (root)	12	4.59	1.17
22	Pepper, sweet	12	4.46	1.13
23	Tomato, wild	9	4.45	1.13
24	Bamboo shoots (labong)	4	3.98	1.01
25	Cowpea (paayap)	6	3.93	1.00
26	Ampalaya (fruit)	12	3.75	0.95
27	Garden beans (habichuelas)	7	3.57	0.91
28	Lettuce	12	3.39	0.86
29	Singkamas	5	3.26	0.83
30	Cucumber	8	2.96	0.75
31	Squash (fruit)	12	2.95	0.75
32	Chayote	12	2.76	0.70
33	Gabi	6	2.68	0.68
34	Kalamismis	8	1.88	0.48
35	Chive (kuchay)	12	1.83	0.46
36	Mungo	12	1.55	0.39
37	Squash, leaves	6	1.19	0.30
38	Tomato, native	6	1.07	0.27
39	Tugui	5	0.98	0.25
40	Patani	7	0.70	0.18
41	Pepper, native, long	12	0.58	0.15
42	Kulitis	2	0.53	0.13
43	Ampalaya, leaves	12	0.53	0.13
44	Pepper, "labuyo"	6	0.52	0.13
45	Malunggay	5	0.43	0.11
46	Sitao	6	0.36	0.09
47	Okra	6	0.35	0.09
48	Togue (mungo sprouts)	12	0.35	0.09
49	Tamarind, leaves	6	0.23	0.06
50	Banana "heart"	12	0.15	0.04
51	Papaya, green	12	0.15	0.04
	Total		393.21	100.00

TABLE 2

Average monthly sale of each kind of fruit by each retailer and proportion to total sales of fruits from January to December, 1951, in Calamba, Laguna

RANK	FRUITS	NUMBER OF MONTHS AVAILABLE	AVERAGE MONTHLY SALES	PERCENTAGE OF TOTAL
			<i>pesos</i>	
1	Mango, Carabao variety	3	43.66	12.13
2	Star apple	5	37.51	10.42
3	Lanzones	5	35.19	9.78
4	Pummelo	5	21.83	6.06
5	Papaya	12	20.54	5.71
6	Banana, Lacatan variety	12	20.11	5.59
7	Banana, Buñgulan variety	12	18.91	5.25
8	Jakfruit	6	18.55	5.15
9	Mango, Pico variety	4	17.34	4.82
10	Chico	6	16.57	4.60
11	Avocado	5	15.40	4.28
12	Batangas mandarin	5	15.14	4.21
13	Atis	4	14.04	3.90
14	Banana, Latundan variety	12	13.57	3.77
15	Banana, Saba variety	12	7.89	2.19
16	Duhat	3	7.62	2.12
17	Siniguelas	4	7.32	2.03
18	Pineapple	4	6.71	1.86
19	Santol	4	3.81	1.06
20	Calamondin	12	3.37	0.94
21	Tamarind, ripe	3	3.30	0.92
22	Breadfruit	3	2.66	0.74
23	Mabolo	2	2.06	0.57
24	Canistel	3	1.45	0.40
25	Kamanchile	4	1.44	0.40
26	Guayabano	5	0.74	0.21
27	Guava	12	0.67	0.19
28	Cashew	6	0.60	0.17
29	Kamias	11	0.49	0.14
30	Makopa	2	0.47	0.13
31	Lime (dayap)	3	0.44	0.12
32	Balimbing	7	0.36	0.10
33	Tamarind, green	8	0.15	0.04
	Total		359.91	100.00

TABLE 3
Average monthly retail prices in centavos of fresh fruits, Calamba, Laguna, 1951

COMMODITY	UNIT	AVERAGE MONTHLY RETAIL PRICES												COEFFI- CIENT OF AVERAGE SEASONAL FLUC- TUATION
		Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	
Vegetables: Flowers and shoots	each	8.0	8.0	7.0	8.0	10.0	7.5	8.0	7.0	6.8	8.0	8.0	7.8	38.1
Banana "heart"	kilo	284.6	222.1	227.5	230.4	230.0	—	—	—	—	—	378.7	250.0	52.1
Cauliflower	each	—	—	—	—	—	36.0	35.5	34.1	37.0	—	—	—	35.4
Bamboo shoots (labong)	each	—	—	—	—	—	—	—	—	—	—	—	—	81.6
Vegetables: Fruits														
Ampalaya	kilo	41.8	35.2	32.3	33.1	36.1	37.7	45.3	41.6	34.9	33.8	34.7	30.7	36.4
Upo	each	46.0	30.0	35.1	36.5	36.5	32.2	35.6	27.3	34.7	32.5	38.1	35.7	52.0
Chayote	kilo	23.0	20.2	23.0	24.0	20.0	55.4	19.8	24.0	21.9	23.6	32.5	34.0	94.6
Cucumber	each	20.5	18.6	—	—	—	—	20.8	15.2	13.8	15.3	12.8	18.5	47.6
Eggplant	each	6.0	5.1	3.0	3.2	3.0	3.1	3.2	2.0	3.3	4.1	5.8	4.2	3.4
Kondol	each	—	—	—	—	—	—	131.8	126.6	115.1	121.0	142.0	150.5	7.7
Melon	each	—	—	41.5	33.0	22.5	10.7	—	—	—	—	—	—	26.9
Okra	each	—	—	—	—	—	0.6	0.6	0.2	0.6	0.5	0.8	—	118.0
Papaya, green ^a	each	3.3	4.1	3.0	3.0	4.0	3.7	4.7	3.3	3.7	4.5	33.4	3.2	0.5
Pepper, sweet	kilo	45.7	55.1	60.1	62.1	85.7	101.0	99.0	86.7	82.0	77.0	68.2	44.4	3.4
Pepper, native, long	each	1.1	1.3	1.1	1.1	1.7	1.4	1.3	1.1	1.4	1.5	1.6	1.1	72.2
Patola	each	—	—	—	—	—	—	18.9	11.0	15.1	16.7	20.3	16.8	77.8
Squash	each	47.8	50.9	55.6	54.4	45.4	41.6	44.6	50.2	47.7	41.5	46.8	51.2	42.8
Tomato, native, large	kilo	87.9	73.8	85.0	100.0	96.7	—	—	—	—	—	—	48.0	59.6
Tomato, "wild" forms	kilo	—	—	—	45.1	41.0	28.3	38.2	37.3	33.3	32.5	38.2	125.0	30.8
Watermelon	each	—	—	92.5	61.0	37.6	45.0	—	—	—	—	—	39.7	52.5
													35.2	43.5
													59.0	34.6
Vegetables: Leaves														
Ampalaya	bundle	3.2	4.1	6.5	6.2	6.0	6.2	5.7	6.4	6.9	5.0	4.0	5.0	5.4
Cabbage	kilo	53.8	47.3	45.0	47.1	40.7	55.1	74.3	73.7	74.8	72.2	61.5	50.0	29.6
Kinchay (Chinese celery)	kilo	50.8	50.4	50.4	80.0	111.7	85.0	131.1	82.6	77.5	75.0	62.0	60.0	89.3
Celery	kilo	—	—	—	—	—	—	—	—	—	—	315.7	335.5	5.9
														325.6

^a Pomologically classified as fruit, but more generally used as vegetable when green.

TABLE 3 (continued)

Kangkong	bundle	5.0	4.0	4.0	5.1	3.7	5.2	2.9	3.1	4.1	3.0	3.4	1.8	3.8	95.6
Kulitis	bundle	—	—	—	6.1	—	—	—	—	—	—	—	—	5.7	7.8
Kuchay	kilo	24.6	27.2	29.1	30.1	40.6	41.7	42.5	40.1	39.9	37.5	33.9	25.2	34.4	20.5
Lettuce	kilo	27.8	24.3	28.9	45.4	70.4	74.7	70.0	60.5	48.0	42.5	40.6	35.0	39.0	40.1
Malunggay	bundle	—	—	—	—	—	6.0	4.9	6.7	5.5	6.4	—	—	5.9	31.0
Mustard	kilo	30.3	35.4	34.1	44.3	42.1	54.2	56.0	57.3	61.0	63.9	64.7	65.3	51.3	73.5
Pechay	kilo	25.3	76.0	32.1	54.1	60.1	71.7	70.3	57.3	45.2	42.7	41.5	45.1	46.1	51.7
Pepper, "labuyo"	bundle	—	—	—	—	—	—	3.0	2.8	3.3	4.3	3.4	3.1	3.3	42.8
Squash	bundle	—	—	—	—	—	—	4.7	4.1	5.7	5.6	5.7	6.1	5.3	39.2
Sweet potato leaves	bundle	2.4	2.5	3.0	3.0	4.1	3.7	3.8	3.4	3.6	3.0	4.0	3.1	3.3	52.3
Tamarind	bundle	—	—	—	—	—	3.6	3.4	3.7	3.2	3.8	3.9	—	3.6	20.0
Vegetables: Roots, tubers, and bulbs															
Carrots	kilo	125.2	136.0	158.9	179.5	205.7	—	—	—	—	386.5	355.0	265.0	238.9	51.1
Garlic	kilo	61.0	64.5	65.4	70.1	85.2	90.2	81.8	69.5	65.5	67.1	67.5	65.0	72.0	38.6
Onion, Multiplier	kilo	93.7	87.7	75.4	80.1	75.5	101.8	101.0	93.0	90.4	88.4	91.3	105.2	90.3	26.0
Onion, Bernuda	kilo	45.3	43.1	43.1	45.1	45.0	54.2	46.3	50.3	42.5	46.9	52.0	45.2	43.2	24.2
Radish	each	4.2	—	—	—	—	3.2	3.5	3.2	2.4	3.9	4.0	4.0	3.6	55.8
Sweet potato	kilo	20.3	20.0	25.0	25.0	21.2	20.8	25.0	25.0	23.0	15.5	21.0	20.7	21.8	46.8
Gabi	kilo	—	—	—	—	—	—	26.7	22.7	20.5	21.7	21.2	24.4	22.8	26.6
Singkanas	bundle	12.2	—	—	—	—	—	—	—	13.5	10.5	7.5	9.8	10.7	56.9
Tugui	kilo	26.1	25.2	—	—	—	—	—	—	—	25.7	22.6	23.1	24.3	14.4
Vegetables: Legumes															
Patani	each	—	—	—	—	1.1	0.4	—	0.6	0.8	0.7	1.1	0.8	0.8	93.3
Habichuelas	kilo	—	—	—	—	—	46.5	45.4	36.9	41.4	34.0	35.2	36.6	39.4	27.9
Cowpea	bundle	—	—	—	—	—	—	15.4	10.7	15.7	10.2	15.0	12.2	13.2	39.9
Kalamisim	each	0.6	0.7	1.1	1.2	1.1	—	—	—	—	1.5	1.0	0.8	1.0	85.7
Togue (mungo sprouts)	liter	10.0	8.0	6.5	6.5	6.2	5.4	5.6	9.2	8.5	15.0	15.7	17.4	9.5	105.3
Pea	kilo	131.5	—	—	—	—	—	—	—	—	188.0	155.7	126.0	150.3	39.5
Sitao (yard-long bean)	each	—	—	—	—	—	—	1.0	0.4	0.6	0.5	0.3	1.3	0.8	25.0
Mungo	ganta	120.3	120.0	126.0	120.0	112.2	114.0	122.9	125.0	130.3	135.5	135.0	132.4	116.1	18.8

TABLE 4
Average monthly retail prices in centavos of fresh vegetables, Calamba, Laguna, 1951

COMMODITY	UNIT	AVERAGE MONTHLY RETAIL PRICES												AVERAGE FOR THE YEAR	COEFFICIENT OF AVERAGE SEASONAL FLUCTUATION
		Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.		
Atis	each	—	—	—	—	—	15.6	10.3	10.2	9.3	—	—	—	11.3	50.8
Avocado	kilo	—	—	—	—	47.7	30.5	35.0	35.7	35.0	—	—	—	36.8	43.9
Bananas:															
Bungulan	each	4.2	4.2	4.2	5.0	4.6	4.4	4.1	4.4	4.5	3.8	3.7	4.7	4.3	30.2
Lacatan	each	3.2	4.3	4.7	5.9	4.8	5.2	5.3	5.5	4.8	4.7	4.3	5.5	4.8	60.0
Latundan	each	1.5	2.0	1.4	1.1	1.2	1.2	1.6	1.6	1.8	1.1	1.6	1.5	1.5	60.0
Saba	each	1.5	1.6	2.4	2.2	1.6	2.0	2.0	3.3	2.3	2.0	2.5	1.9	2.1	75.0
Balinbing	each	1.9	1.3	1.2	1.5	1.9	2.0	1.6	—	—	—	—	—	1.6	50.0
Breadfruit	each	—	—	—	—	—	—	20.5	16.3	19.0	—	—	—	18.6	17.4
Canistel (tiesa)	each	15.3	16.7	—	—	—	—	—	—	—	—	—	14.5	14.5	15.5
Casuy	each	4.7	5.3	4.2	2.3	4.0	—	—	—	—	—	—	—	4.1	78.9
Chico	each	3.2	4.4	5.2	—	—	—	—	—	—	4.3	4.7	4.5	4.4	28.9
Calamondin	each	1.0	1.6	1.3	0.8	1.1	1.0	1.0	1.6	1.6	1.3	0.9	0.8	1.16	149.4
Duhat	liter	—	18.6	14.2	11.2	—	—	—	—	—	—	—	—	14.6	50.6
Guayebano	each	—	—	—	—	—	—	35.6	30.3	25.3	20.5	30.5	—	28.4	57.1
Guava	each	1.7	1.1	1.6	1.3	1.7	1.4	1.6	1.0	0.82	1.5	0.9	1.4	1.3	89.8
Jakfruit	each	—	—	—	—	281.2	210.0	215.0	256.2	248.7	221.2	—	—	238.7	28.9
Kamanchile	each	—	—	0.8	0.7	0.7	—	—	—	—	—	—	—	0.8	54.2
Kanias	each	1.0	1.2	0.9	1.4	—	0.9	0.8	1.5	1.5	1.0	1.2	0.9	1.1	60.8
Lanzones	kilo	—	—	—	—	—	—	246.3	145.0	122.5	219.5	148.7	—	176.4	51.7
Lime (dayap)	each	—	—	—	—	9.7	—	9.3	8.7	—	—	—	—	9.2	11.4
Mabolo	each	—	—	—	—	—	—	—	—	8.7	7.2	—	—	7.9	20.3
Makopa	each	—	—	—	—	—	—	2.7	1.3	—	—	—	—	2.0	70.0
Mango, ripe:															
Carabao variety	each	—	—	—	—	29.7	26.0	25.0	—	—	—	—	—	28.9	17.2
Pico variety	each	—	—	—	—	10.4	6.0	5.0	9.5	—	—	—	—	7.7	70.1
Naranjita	each	—	—	—	—	—	—	—	9.7	7.3	7.5	10.0	6.0	8.1	50.0

per cent

TABLE 4 (continued)

Papaya, ripe	each	35.0	37.0	34.2	24.9	25.2	31.7	42.7	41.0	33.0	43.2	43.5	33.3	35.7	54.4
Pineapple	each	—	—	—	—	—	33.0	26.0	33.5	39.2	—	—	—	32.9	40.6
Pummelo	each	—	—	—	—	—	—	—	22.7	25.0	22.0	17.5	18.7	21.2	35.4
Santol	each	—	—	—	—	—	2.0	1.4	1.3	1.6	—	—	—	1.6	43.7
Star apple	each	20.2	15.2	12.7	10.5	9.9	—	—	—	—	—	—	—	13.7	69.6
Siniguelas	each	—	—	2.1	0.8	1.0	1.5	—	—	—	—	—	—	1.3	92.9
Tamarind, ripe	each	1.3	1.7	—	—	—	—	—	—	—	—	—	—	1.5	26.6
Tamarind, green	each	0.83	0.9	1.3	—	—	—	—	1.3	1.5	0.6	0.6	0.6	0.9	85.7

COLLEGE AND ALUMNI NOTES

Mr. Teofilo M. Mendoza, '49, assistant soil technologist in the Bureau of Soil Conservation, left on August 29 for the United States as a Standard Vacuum Oil Company scholar. He will pursue advanced studies in mechanized farming at the College of Agriculture, University of California.

Mr. Pedro A. Rodrigo, '21, chief of the horticulture research section of the Bureau of Plant Industry, left for London by plane. He is a delegate of the government to the 13th International Horticultural Congress. He will visit Hawaii, the United States, and various countries in Europe after the congress.

Mr. Rafael Macahilig, '38, faculty member of the Banga Agricultural School, is on his way to the United States to take up graduate work on vocational agriculture at the University of Florida.

Dr. Pablo N. Mabbun, '23, economist in the Rehabilitation Finance Corporation, enplaned for the United States recently. He is the Philippine delegate to an international conference on farm credit and cooperatives.

The Ambassador to India and Mrs. Chester Bowles visited this College on August 29, 1952. They were accompanied by Director Ray A. Johnson and Dean L. E. Call. Dr. and Mrs. Henry Townes, entomologists assigned to the Bureau of Plant Industry under the MSA technical assistance program, were also campus visitors.

Dr. José M. Capinpin, head of the Department of Agricultural Botany, was designated one of the geneticists and rice breeders to cooperate with the International Rice Commission in supplementing the world catalogue of genetic stocks of rice and in encouraging cooperation among rice breeders with a view to stimulating and strengthening national rice breeding programs. This information was received from Mr. R. A. Silow, Plant Production Branch, Agricultural Division of the Food and Agricultural Organization of the United Nations.

A demonstration to show the effects of fertilizer on corn and upland rice was held on August 23, 1952, for about six hundred farmers from Laguna and other nearby provinces. The demonstration was the chief feature of the Soil Fertility Field Day celebration held under the joint auspices of the Bureau of Agricultural Extension Service, the Fertilizer Administration, the Department of Agriculture and Natural Resources, the MSA, and the U. P. College of Agriculture. Dean L. B. Uichanco welcomed the guests. Mr. Domingo B. Paguirigan, Director of the Bureau of Agricultural Extension Service, gave the response. Remarks were also given by Director Ray A. Johnson of the MSA. In the program given after the lunch hour, the following numbers were rendered: vocal solos by

Irving Villazor, Reynalda Ramos, and Serapio Sapin; folk dances by selected P.E. students; a balagtasan by RHS students; and an instrumental selection by Eriberto Alonzo. Short talks and a panel discussion, with Director Francisco Galang as moderator, followed.

A dance was held by the dormitory residents on August 30, 1952, at the Molawin Mess Hall. The president of the residents is Ildefonso Capinpin and the adviser, Mr. Pablo Alfonso, Jr.

The following have been elected presidents and advisers of student organizations for this semester, 1952-1953: Student Body Organization, Rodolfo Ylarde, Dr. V. C. Calma; Senior Class, Lino Nazareno, Mr. N. B. Tablante; Junior Class, Francisco Ascalon, Mr. N. B. Tablante; Sophomore Class, Archimides Laurel, Dr. J. R. Velasco; Freshman Class, Jose Masibay, Dr. S. M. Cendaña; Speech and Dramatics Club, Sofronio Blando, Miss N. Dunglao; Philippine Country Life Association, Romualdo Lapis, Dr. F. M. Sacay; Associate Women Students, Concepcion Valera, Mrs. O. F. Sison; Upsilon Sigma Phi, Verden Dañgilan, Dr. F. T. Orillo; Beta Sigma Fraternity, Onofre Griño, Mr. R. Guillermo; UPSCA, Edilberto A. Uichanco, Mr. W. L. Fernandez; Ranchers' Club, Prospero Pajarillaga, Mr. A. C. Campos; and Mimes Mummers Scribblers, Emmanuel Pili, Dr. Antonio G. Tan.

STATION

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